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centre of mass of the Earth and Moon from fixed elliptic motion, due to the attractions of the planets; and, the most difficult of all, the effects of the direct attractions of the planets on the Moon. There are many periodic coefficients, due to the last, larger than one-tenth of a second of arc in magnitude, and the whole subject needs a careful and extended investigation. An attempt to complete the problem by considering anew these remaining sources of disturbance has been already started. The difficulties presented appear to arise much less from intricate calculations than in the construction of a satisfactory method which will give the assurance that no sensible terms have been neglected. If a moderate degree of success attends these efforts it should be possible to discover whether, within the limits set by the observations, the motion of the Moon shows effects which cannot be traced to the direct operation of the Newtonian law of gravitation.

Haverford College: 1904 *November* 18.

Analysis of 145 *Terms in the Moon's Longitude,* 1750–1901.

By P. H. Cowell.

In this paper I give an analysis for 145 terms in the Moon's longitude. The observations used are the Greenwich meridian observations from 1847 to 1901; and in the case of all terms whose period exceeds two months, or whose period is equal or nearly equal to the anomalistic month or a sub-multiple of it, the analysis is extended so as to embrace the period 1750 to 1851 as well.

I have used the lunar day as the unit of time. The advantage of doing this is explained in a previous paper (vol. lxiv. May).

For the short-period analyses I have adopted auxiliary angles which complete an exact number of revolutions in an exact number of lunar days. The advantage of doing this is explained at the end of the paper above referred to. Owing, however, to the absence of observations near new moon it is not possible to adopt an auxiliary angle instead of the mean elongation D; during a single period of analysis (400 lunar days) I have treated D as going through two revolutions in 57 lunar days, but the error has not been allowed to accumulate from period to period (vol. lxiv. December). This distinction is rendered necessary, because the analysis for sin D is not similar to that for cos D, whereas that for sin ${}_mA_n$ is similar to that for cos ${}_mA_n$, the angle ${}_mA_n$ being defined as completing n revolutions in m days.

TABLE I.

Auxiliary Angles and their Epochs used for Short-period Analyses.

Angles.							Epochs at which the Angles pass through the Value Zero. Lunar Days.
${}_{80}A_3$,	${}_{80}A_5$,	${}_{80}A_8$,					0·5
${}_{74}A_2$,	${}_{74}A_3$,	${}_{74}A_5$,	${}_{74}A_6$,	${}_{74}A_8$,	${}_{74}A_{10}$,	${}_{74}A_{16}$	0·0
${}_{53}A_2$,	${}_{53}A_4$,	${}_{53}A_6$,	${}_{53}A_8$,	${}_{53}A_{10}$,			0·0
${}_{51}A_4$,							0·0
${}_{49}A_7$,	${}_{49}A_9$,						0·0
${}_{43}A_5$,							0·0
${}_{41}A_1$,	${}_{41}A_3$,	${}_{41}A_6$,					0·0
${}_{9}A_4$,							0·0
${}_{3}A_1$,	${}_{34}A_2$,						−1·5
${}_{3}A_1$,	${}_{31}A_2$,	${}_{31}A_3$,					0·0
${}_{29}A_4$,							0·0
${}_{28}A_5$,							0·0
${}_{27}A_3$,	${}_{27}A_4$,	${}_{27}A_6$,					0·0
${}_{23}A_1$,	${}_{23}A_4$,						0·0
${}_{22}A_1$,							0·0
D,	2D,	3D,	4D,	5D,			...

Table I. gives a list of the auxiliary angles; the mean motion of every angle is implied in its symbol; its definition is, therefore, completed by its epoch. The second column of the table gives he interval after the mean lunar noon of 1750 September 12^d 9^h, t which the auxiliary angles took the value zero. The want of symmetry about the 34-day analysis is due to its having been erformed about last May, before the complete scheme of analysis ad been drawn up. Its epoch was chosen at haphazard. It ill be seen that the strips that I have described in the paper oted (vol. lxiv. May) have to be arranged in sixteen different ays (and in a seventeenth way for the D analysis), so as to ing the lines representing every 80th, every 74th, &c., day suc-csively into juxtaposition. The sums of the errors for corresponding days are then easily formed. This stage occupies one computer about fifteen minutes for one analysis for one period. The present paper contains (counting the analyses for the Airy observations) about 1000 repetitions of this process. When such an angle as ${}_{49}A_9$ is necessary to the scheme it is clearly economical of labour to use ${}_{49}A_7$ in preference to ${}_{7}A_1$.

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TABLE II.

Short-period Terms.

Ref. No.	Argument.	Movement in One Lunar Day.	Auxiliary Angle.	Excess of Argument over Auxiliary Angle	
				at T_0.	in 400 Lunar Days $=2\theta$.
1	$2g-5g'+2\omega-2\omega'$	22°·175632	$80A_5$	11°·46	−129°·7472
2	$2g-5g'+4\omega-4\omega'$	22·406154	„	264·08	− 37·5384
3	$3g-5g'+4\omega-4\omega'$	35·929074	$80A_8$	243·85	− 28·3704
4	$g-4g'+2\omega-4\omega'$	9·563141	$74A_2$	160·81	− 66·6356
5	$g-4g'+2\omega-2\omega'$	9·672858	„	293·67	− 22·7488
6	$g-4g'+4\omega-4\omega'$	9·903380	„	186·29	+ 69·4600
7	$g+g'-2\omega+2\omega'$	14·312544	$74A_3$	118·05	−112·8204
8	$g+g'-\omega+\omega'$	14·427805	„	64·36	− 66·7160
9	$g+g'$	14·543066	„	10·67	− 20·6116
10	$g+g'+\omega+\omega'$	14·768044	„	89·84	+ 69·379
11	$2g-3g'+2\omega-2\omega'$	24·215924	$74A_5$	304·34	− 43·360
12	$2g-3g'+3\omega-3\omega'$	24·331185	„	250·65	+ 2·740
13	$2g-3g'+4\omega-4\omega'$	24·446446	„	196·96	+ 48·844
14	$2g+2g'-2\omega+2\omega'$	28·855610	$74A_6$	128·72	−133·430
15	$2g+2g'+2\omega'$	29·195849	„	154·20	+ 2·666
16	$3g-2g'+2\omega-2\omega'$	38·758990	$74A_8$	315·01	− 63·9710
17	$3g-2g'+3\omega-3\omega'$	38·874251	„	261·32	− 17·8676
18	$3g-2g'+4\omega-2\omega'$	39·099229	„	340·49	+ 72·1236
19	$4g-6g'+4\omega-4\omega'$	48·431848	$74A_{10}$	248·68	− 86·7208
20	$4g-6g'+6\omega-6\omega'$	48·662370	„	141·30	+ 5·4880
21	$6g-4g'+4\omega-4\omega'$	77·517980	$74A_{16}$	270·02	−127·9440
22	$g-\omega+\omega'$	13·407659	$53A_2$	349·30	− 70·8988
23	g	13·522920	„	295·61	− 24·7944
24	$g+\omega-\omega'$	13·638181	„	241·92	+ 21·310
25	$g+2\omega-2\omega'$	13·753442	„	188·23	+ 67·414
26	$g+2\omega$	13·863159	„	321·09	+111·301
27	$2g$	27·045840	$53A_4$	231·22	− 49·588
28	$2g+\omega-\omega'$	27·161101	„	177·53	− 3·48
29	$2g+2\omega-2\omega'$	27·276362	„	123·84	+ 42·62
30	$2g+2\omega$	27·386079	„	256·70	+ 86·50
31	$3g$	40·568760	$53A_6$	166·83	− 74·38
32	$3g+2\omega$	40·908999	„	192·31	+ 61·71
33	$4g$	54·091680	$53A_8$	102·44	− 99·17
34	$4g+2\omega$	54·431919	„	127·92	+ 36·90
35	$4g+4\omega$	54·772158	„	153·40	+173·05

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Ref. No.	Argument.	Movement in One Lunar Day.	Auxiliary Angle.	Excess of Argument over Auxiliary Angle at T_0	in 400 Lunar Days $=2\theta$.
36	$5g$	67°·614600	$53A_{10}$	38°·05	−123°·9720
37	$5g+2\omega$	67·954839	,,	63·53	+ 12·1236
38	$2g+g'-\omega+\omega'$	27·950725	$51A_4$	109·13	−113·8268
39	$2g+g'$	28·065986	,,	55·44	− 67·7224
40	$2g+g'+2\omega$	28·406225	,,	80·92	+ 68·3732
41	$4g-3g'+2\omega-2\omega'$	51·261764	$49A_7$	236·41	− 66·7236
42	$4g-3g'+4\omega-4\omega'$	51·492286	,,	129·03	+ 25·4852
43	$4g-3g'+4\omega-2\omega'$	51·602003	,,	261·89	+ 69·3720
44	$5g-2g'+2\omega-2\omega'$	65·804830	$49A_9$	319·50	−127·0484
45	$5g-2g'+4\omega-2\omega'$	66·145069	,,	344·98	+ 9·0472
46	$3g+g'$	41·588906	$43A_5$	10·45	−108·6236
47	$3g+g'+2\omega$	41·929145	,,	35·93	+ 27·4720
48	$g-5g'+2\omega-2\omega'$	8·652712	$41A_1$	246·81	− 51·1104
49	$2g-g'$	26·025694	$41A_3$	240·76	−126·3080
50	$2g-g'+\omega-\omega'$	26·140955	,,	187·07	− 80·2036
51	$2g-g'+2\omega-2\omega'$	26·256216	,,	133·38	− 34·0992
52	$4g-2g'+2\omega-2\omega'$	52·281910	$41A_6$	14·14	−160·4072
53	$4g-2g'+4\omega-2\omega'$	52·622149	,,	39·62	− 24·3116
54	$3g-4g'+2\omega-2\omega'$	36·718698	$39A_4$	115·37	− 81·7512
55	$3g-4g'+4\omega-4\omega'$	36·949220	,,	7·99	+ 10·4576
56	$g-3g'-2\omega'$	10·352765	$34A_1$	78·02	− 94·1880
57	$g-3g'+\omega-3\omega'$	10·468026	,,	24·33	− 48·0836
58	$g-3g'+2\omega-2\omega'$	10·693004	,,	103·50	+ 41·9076
59	$g-3g'+3\omega-3\omega'$	10·808265	,,	49·81	+ 88·0120
60	$2g-6g'+4\omega-4\omega'$	21·386008	$34A_2$	207·00	+ 83·8152
61	$g-2g'-2\omega'$	11·372911	$31A_1$	268·31	− 95·9968
62	$g-2g'$	11·482628	,,	41·17	− 52·1100
63	$g-2g'+\omega-\omega'$	11·597889	,,	347·48	− 6·0056
64	$g-2g'+2\omega-2\omega'$	11·713150	,,	293·79	+ 40·0988
65	$2g-4g'+2\omega-2\omega'$	23·195778	$31A_2$	334·96	− 12·0112
66	$2g-4g'+3\omega-3\omega'$	23·311039	,,	281·27	+ 34·0932
67	$2g-4g+4\omega-4\omega'$	23·426300	,,	227·58	+ 80·1976
68	$3g-6g'+4\omega-4\omega'$	34·908928	$31A_3$	268·75	+ 28·0876
69	$3g-6g'+6\omega-6\omega'$	35·139450	,,	161·37	+120·2964
70	$4g-5g'+4\omega-4\omega'$	49·451994	$29A_4$	18·78	− 81·2712
71	$5g-4g'+4\omega-4\omega'$	63·995060	$28A_5$	123·98	−116·2620
72	$5g-4g'+6\omega-4\omega'$	64·335299	,,	149·46	+ 19·8336

Ref. No.	Argument.	Movement in One Lunar Day.	Auxiliary Angle.	Excess of Argument over Auxiliary Angle at T_0.	Excess of Argument over Auxiliary Angle in 400 Lunar Days $=2\theta$.
73	$3g-g'$	39°·548614	${}_{27}A_3$	335°·17	−180°·5544
74	$3g-g'+\omega-\omega'$	39·663875	„	281·48	−134·4500
75	$3g-g'+2\omega-2\omega'$	39·779136	„	227·79	− 88·3456
76	$3g-g'+2\omega$	39·888853	„	0·65	− 44·4588
77	$3g-g'+3\omega-\omega'$	40·004114	„	306·96	+ 1·6456
78	$4g-g'+2\omega-2\omega'$	53·302056	${}_{27}A_4$	0·89	− 12·5108
79	$6g-2g'+4\omega-2\omega'$	79·667989	${}_{27}A_6$	228·44	−132·8044
80	$g+2g'-2\omega+2\omega'$	15·332690	${}_{23}A_1$	79·78	−127·7936
81	$g+2g'$	15·563212	„	332·40	− 35·5848
82	$g+2g'+2\omega'$	15·672929	„	105·26	+ 8·3020
83	$5g-6g'+6\omega-6\omega'$	62·185290	${}_{23}A_4$	29·27	−169·3624
84	$g+3g'-2\omega+2\omega'$	16·352836	${}_{22}A_1$	304·12	− 4·3200
85	$g-g'$	12·502774	D	53·69	− 46·1043
86	$g-g'+\omega-\omega'$	12·618035	„	0	0
87	$g-g'+2\omega-2\omega'$	12·733296	„	306·31	+ 46·1043
88	$2g-2g'-2\omega'$	24·895831	2D	334·52	−136·0956
89	$2g-2g'$	25·005548	„	107·38	− 92·2086
90	$2g-2g'+\omega-\omega'$	25·120809	„	53·69	− 46·1043
91	$2g-2g'+2\omega-2\omega'$	25·236070	„	0	0
92	$2g-2g'+3\omega-3\omega'$	25·351331	„	306·31	+ 46·1043
93	$2g-2g'+4\omega-2\omega'$	25·576309	„	25·48	+136·0956
94	$3g-3g'+2\omega-2\omega'$	37·738844	3D	53·69	− 46·1043
95	$3g-3g'+3\omega-3\omega'$	37·854105	„	0	0
96	$3g-3g'+4\omega-4\omega'$	37·969366	„	306·31	+ 46·1043
97	$3g-3g'+4\omega-2\omega'$	38·079083	„	79·17	+ 89·9913
98	$4g-4g'+4\omega-4\omega'$	50·472140	4D	0	0
99	$4g-4g'+6\omega-4\omega'$	50·812379	„	25·48	+136·0956
100	$5g-5g'+4\omega-4\omega'$	62·974914	5D	53·69	− 46·1043
101	$2D-V+E$	24·597940	${}_{74}A_5$	260·91	+109·4460
102	$2D-g-V+E$	11·075020	${}_{34}A_1$	60·07	+194·7139
103	$2D-2V+2E$	23·959810	${}_{74}A_5$	213·33	−145·8062
104	$2D-g+2V-2E$	12·989411	D	37·33	+148·5505
105	$2D-g-2V+2E$	10·436889	${}_{34}A_1$	12·50	− 60·5383
106	$g-3V+3E$	11·608529	${}_{31}A_1$	266·72	− 1·7497

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Ref. No.	Argument.	Movement in One Lunar Day.	Auxiliary Angle.	Excess of Argument over Auxiliary Angle	
				at T_0	in 400 Lunar Days $=2\theta$.
107	$2D-g+3V-3E$	13°·627542	${}_{53}A_2$	322°·69	+ 17°·0543
108	$2D-E+J$	24·301919	${}_{74}A_5$	286·99	− 8·9623
109	$2D-g+E-J$	12·647302	D	323·68	+ 11·7066
110	$2D-g-E+J$	10·778999	${}_{34}A_1$	86·15	+ 76·3056
111	$g-2E+2J$	11·654618	${}_{31}A_1$	6·45	+ 16·6859
112	$2D-g+2E-2J$	13·581453	${}_{53}A_2$	222·95	− 1·3813
113	$g+2\varpi-3J+7^\circ$	13·495528	${}_{53}A_2$	147·81	− 35·7513
114	$g-\text{☊}$	13·577730	${}_{53}A_2$	262·53	− 2·8702
115	$g+\text{☊}$	13·468110	${}_{53}A_2$	328·68	− 46·7184
116	$2g+2\omega+\text{☊}$	27·331269	${}_{53}A_4$	289·78	+ 64·5829

TABLE III.

Terms of Periods Comparable with One Year.

Ref. No.	Arg.	Unit.	Movement in 40 Lunar Days		Value at T_0	
			in Degrees.	in Units.	in Degrees.	in Units.
117	$4g'-2\omega+2\omega'$		See No. 123.			
118	$3g'+2\omega'$	$360\div\frac{17}{6}$	126°·80619	$1-\frac{1}{6}\times 0{\cdot}011930$	145°·2749	$6{\cdot}8602\div 6$
119	$3g'$		See No. 128.			
120	$3g'-2\omega+2\omega'$	$360\div\frac{19}{6}$	113·19663	$1-\frac{1}{6}\times 0{\cdot}025733$	119·7855	$6{\cdot}3220\div 6$
121	$2g'+2\omega'$	$360\div\frac{21}{5}$	86·00036	$1+\frac{1}{5}\times 0{\cdot}016688$	141·1374	$8{\cdot}2330\div 5$
122	$2g'$		See No. 128.			
123	$2g'-\omega+\omega'$	$360\div\frac{14}{3}$	77·00123	$1-\frac{1}{3}\times 0{\cdot}005508$	61·9615	$2{\cdot}4096\div 3$
124	$2E-2J$		See No. 130.			
125	$2g'-2\omega+2\omega'$		See No. 131.			
126	$2V-2E$		See No. 135.			
127	$g'+2\omega'$	$360\div 8$	45·19453	$1+\quad 0{\cdot}004323$	136·9999	3·0444
128	g'	$360\div 9$	40·80583	$1+\quad 0{\cdot}020146$	4·1375	0·1034
129	$2E-2M$	$360\div\frac{47}{5}$	38·22036	$1-\frac{1}{5}\times 0{\cdot}010120$	98·1768	$12{\cdot}8175\div 5$
130	$E-J$	$360\div\frac{29}{3}$	37·36605	$1+\frac{1}{3}\times 0{\cdot}010043$	21·4980	$1{\cdot}7318\div 3$
131	$g'-\omega+\omega'$	$360\div 10$	36·19540	$1+\quad 0{\cdot}005428$	57·8240	1·6062
132	$3V-4E-2^\circ$	$360\div 10$	35·76947	$1-\quad 0{\cdot}006404$	37·0854	1·0302
133	$E-2J+298^\circ$	$360\div\frac{32}{3}$	33·92591	$1+\frac{1}{3}\times 0{\cdot}015636$	237·3525	$21{\cdot}0980\div 3$
134	$g'-2\omega+2\omega'$	$360\div\frac{57}{5}$	31·58497	$1+\frac{1}{5}\times 0{\cdot}000954$	111·5105	$17{\cdot}6558\div 5$
135	$V-E$	$360\div 14$	·52522	$1-\quad 0{\cdot}007353$	47·5763	1·8502

TABLE IV.

Terms of Periods Comparable with Ten Years.

Ref. No.	Arg.	Unit.	Movement in 200 Lunar Days		Value at T_0	
			in Degrees.	in Units.	in Degrees.	in Units.
136	2ω	$360 \div \frac{16}{3}$	68°·0478	$1 + \frac{1}{3} \times 0{\cdot}02435$	25°·4894	$1{\cdot}1329 \div 3$
137	$2V - 3E - 5^\circ$	$360 \div 7$	51·2212	$1 - 0{\cdot}00403$	346·5091	6·7377
138	$2\omega - 2\omega'$		See No. 140.			
139	$4M - 2E + 98^\circ$		See No. 142.			
140	$\omega - \omega'$	$360 \div 16$	23·0522	$1 + 0{\cdot}02454$	306·3135	13·6139
141	$J + 9^\circ$	$360 \div 21$	17·2007	$1 + 0{\cdot}00337$	91·1455	5·3168
142	$2M - E + 49^\circ$	$360 \div 28$	12·9292	$1 + 0{\cdot}00560$	54·4667	4·2363
143	$2\varpi - 2J$	$360 \div 31$	11·7222	$1 + 0{\cdot}00941$	287·3482	24·7439
144	$-☊$	$360 \div 33$	10·9620	$1 + 0{\cdot}00485$	326·9251	29·9681
145	$-2\varpi + 3J - 7^\circ$	$360 \div 66$	5·4785	$1 + 0{\cdot}00439$	147·7973	27·0962

Table II. gives a list of 116 short period terms. I selected for analysis those terms whose coefficients appeared from theory to exceed 0″·1. The only use made of theory is to give the arguments. In all cases the coefficient is deduced from observation. The argument is in the second column of the table, the first column containing a reference number. The third column gives the mean motion of the argument in one lunar day, and the fourth column the auxiliary angle whose mean motion is nearly equal to that of the argument. The fifth column gives the excess of the argument over the auxiliary angle at T_0, or the middle of my forty-fourth period of analysis (the calendar date, which I never use, is given on vol. lxiv. p. 421); in the sixth column the excess of motion in 400 lunar days of the argument over the auxiliary angle is given. I call this excess 2θ. The order of Table II. is (i.) Solar; (ii.) *Venus*; (iii.) *Jupiter*; (iv.) figure of Earth terms; for the solar terms the order of the auxiliary angles is that of Table I.; when several terms have the same auxiliary angle the slowest term is put first. Table III. gives a list of terms of period comparable with one year, and Table IV. gives a list of terms of period comparable with ten years. The order is that of mean motion. The method of analysis is explained in vol. lxiv. June. The reference numbers run consecutively with Table II.

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Table V.

Mean Error of Moon's Longitude for each of 890 *Columns of Forty Lunar Days each in Tenth of a Second of Arc.*

Columns

	1 to 40.	41 to 80.	81 to 120.	121 to 160.	161 to 200.	201 to 240.	241 to 280.	281 to 320.	321 to 360.	361 to 400.	401 to 440.	441 to 480.
1	+80	+13	− 6	−40	−27	−35	−50	−66	−29	− 71	−43	−18
2	+53	+ 4	+13	−23	+ 3	−49	−32	−45	−36	− 50	+ 3	+ 2
3	+58	+ 3	+13	−10	−53	− 3	−15	−18	−40	− 21	−43	− 2
4	+52	+13	+24	(−25)	− 8	−27	−36	−41	−46	− 40	+ 5	− 7
5	+29	+15	−11	−26	− 1	−21	−21	−32	−10	− 52	−13	−11
6	+38	+10	− 3	+21	−33	−33	−29	−50	−20	− 51	+ 6	−25
7	+67	0	+ 8	−17	0	−46	−59	−36	− 8	− 60	+ 7	−18
8	+60	+12	+34	+27	−18	−25	−47	−45	−23	− 55	−18	−35
9	+59	− 5	+23	(+ 4)	−20	−20	−74	−31	−35	− 56	−27	−31
10	+43	+ 3	+11	−17	−45	−34	−57	−39	−38	− 79	−29	−30
11	+22	+37	+20	+45	−31	−32	−85	−34	−55	− 64	+11	− 3
12	+31	−20	+23	− 5	−35	−40	−60	−28	−19	− 40	− 1	−13
13	+12	+ 9	+12	− 2	−39	−59	−43	−45	−49	− 51	−31	−20
14	+ 8	+21	+34	+ 3	−34	−44	(−62)	−40	−33	− 51	−15	−24
15	+ 5	+ 3	+18	−10	−34	−34	(−63)	−52	−30	− 70	−37	−25
16	+17	+34	+ 8	− 4	− 5	−23	(−61)	−55	−59	− 67	−19	−18
17	+24	+12	+15	+13	−45	−45	−81	−31	−48	− 37	−41	+29
18	+39	+ 6	+ 3	+15	−36	−31	−53	−13	−84	− 65	−44	− 5
19	+28	+26	+18	+14	−47	−35	−54	−20	−81	− 61	−30	−12
20	+14	+ 5	− 2	+11	−19	(−34)	−54	− 3	−43	− 52	+20	− 7
21	+19	+11	+21	+10	+ 1	(−54)	−50	−33	−75	− 47	−32	−12
22	+19	+15	− 7	+12	− 4	−69	−15	−22	−17	− 57	−18	−34
23	+29	+ 6	− 4	+ 3	0	−38	−24	−21	−46	− 87	−26	−35
24	+47	+15	+ 6	−23	−17	−72	−45	−44	−34	− 57	−31	−30
25	+16	− 8	+19	− 2	−14	−35	−47	−35	−40	− 37	−36	− 9
26	+51	+22	+ 2	+24	−28	−29	−55	−30	−51	− 47	−21	−29
27	+ 7	+34	− 5	+26	−39	−17	−44	−17	−27	− 64	−14	−16
28	+ 6	+10	−14	+32	−17	−34	−21	−42	−75	−100	− 6	−10
29	+ 8	− 8	+49	−12	−21	−60	−25	−18	−47	− 64	[−14]	− 2
30	+36	+24	+42	−14	− 4	−70	−35	−26	−29	− 59	−14	− 2
31	+25	+ 5	+30	− 6	+ 3	−51	−35	−39	−39	− 71	− 4	−19
32	+30	− 1	− 1	− 8	+ 4	−39	−51	−41	−48	− 73	−23	+ 3
33	+25	+23	+ 5	− 9	−14	−29	+ 8	−36	−55	− 51	−12	−26
34	+34	+33	+ 5	−20	−19	−42	−13	−19	−57	− 50	− 4	−22
35	+31	0	+46	− 8	+ 8	−16	−21	−26	−69	− 25	−33	− 8
36	+33	+41	+43	+11	−15	−32	−32	−27	−40	− 32	− 1	− 1
37	+14	+ 4	+22	− 3	−15	−31	−25	−16	−42	− 52	− 3	−20
38	+15	+14	+19	−22	−12	−51	−25	−23	−67	− 55	−40	+12
39	+ 6	+30	+23	+32	−22	−48	−23	−47	−56	− 61	+ 4	+14
40	+17	+17	+15	+ 2	−20	−42	−13	−44	−65	− 29	−28	−13

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	Columns										
	481 to 520.	521 to 560.	561 to 600.	601 to 640.	641 to 680.	681 to 720.	721 to 760.	761 to 800.	801 to 840.	841 to 880.	881 to 890.
1	−14	−25	+23	+29	− 4	+12	+14	+14	+ 1	−20	−32
2	+14	−10	+12	+ 6	− 9	+15	+21	+14	+11	−26	−21
3	−29	−37	+19	+14	− 2	+ 2	+55	+ 5	+ 1	−22	−45
4	+ 3	−51	+29	+12	+15	−15	+46	−16	+ 1	−19	−32
5	0	−47	+29	+ 4	+10	−20	+31	+10	+18	− 4	−28
6	+ 8	−35	+18	+17	+26	+15	+53	+14	+ 9	+ 1	−30
7	+21	+ 7	+40	+44	+29	+ 3	+27	+14	+28	+ 1	−49
8	+ 7	−36	+ 3	+40	+17	+12	+ 4	+35	− 9	− 3	−36
9	−10	−21	− 9	+50	+32	+21	+15	+24	+ 3	− 4	−43
10	−24	−18	+ 7	+36	− 5	+ 3	+11	−15	− 4	−24	−38
11	−22	−20	+29	+24	+10	−44	+13	− 4	− 7	−15	...
12	−16	−16	+17	+ 9	+ 1	−32	+29	− 3	−27	− 9	...
13	−10	− 4	−21	+ 8	− 7	−34	+ 8	− 1	− 8	−31	...
14	−12	+ 1	− 4	+ 1	−11	−16	+13	+ 9	− 3	−20	...
15	− 5	− 2	− 2	+17	+15	+10	+30	+20	+ 2	− 6	...
16	− 9	+ 3	+15	+37	+ 1	+25	+25	+25	+ 3	− 4	...
17	− 4	−20	0	+38	+24	− 2	+ 7	+36	+34	0	...
18	+ 6	0	+18	+43	(+17)	+17	+24	+15	+19	− 7	...
19	−12	−22	+21	+ 5	(+17)	− 4	+45	+ 1	+11	−33	...
20	−10	−27	− 1	+10	+26	+14	+21	−22	−20	−45	...
21	+10	−26	0	+ 2	+11	− 3	+ 9	− 7	−26	−36	...
22	−21	−20	+ 7	− 6	+ 4	−26	+10	−18	−11	−32	...
23	−16	−17	+40	−11	− 3	− 9	0	+ 1	+10	−47	...
24	+ 7	−23	+10	+ 4	+ 9	−14	+35	−20	− 5	−40	...
25	+ 5	−18	+15	+32	+16	− 7	+27	+24	+12	−23	...
26	+ 1	0	+24	+19	+15	− 1	+22	+11	+ 1	−10	...
27	−13	0	+26	+12	+21	+22	+14	+13	+11	−27	...
28	− 3	− 5	+17	+19	+17	+31	+36	− 5	−15	−34	...
29	+ 2	−45	+27	+14	+ 1	+ 6	+17	+10	−13	−41	...
30	−33	+ 7	+15	− 5	−11	− 7	+24	−26	−18	−23	...
31	− 6	−12	+16	−10	− 5	+26	+22	+ 1	−21	−40	...
32	−19	−17	+ 9	0	+ 3	− 6	+10	−11	−13	−12	...
33	−10	−16	+28	− 2	− 4	+18	− 6	− 3	−35	−23	...
34	−22	−12	+10	+ 9	− 1	+16	+12	+ 6	−32	−26	...
35	− 4	−15	+ 8	+12	− 8	+ 3	+ 7	+25	−10	+ 2	...
36	−46	+ 4	+16	+34	−13	+34	− 9	+24	−31	−20	...
37	−49	−22	+13	+47	+20	+14	+ 7	+ 9	+13	−36	...
38	−26	+ 7	+12	+27	− 5	+34	+16	[+15]	−43	−46	...
39	−22	− 5	−20	−14	−20	+12	+25	+ 4	−19	−26	...
40	−32	− 2	+19	+18	+23	+13	+27	+22	−16	−30	...

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Table VI.

Mean Error of Moon's Longitude for each of 178 *Half-Periods of* 200 *Lunar Days each in Tenths of a Second of Arc.*

	1A to 8B.	9A to 16B.	17A to 24B.	25A to 32B.	33A to 40B.	41A to 48B.	49A to 56B.	57A to 64B.	65A to 72B.	73A to 80B.	81A to 88B.	89A and 89B.
1	+28	− 8	− 2	+ 8	+11	+13	+12	+24	− 9	+20	+10	+2
2	+27	0	− 8	−14	+18	+19	+17	+14	+ 9	+ 9	+ 9	−5
3	−11	+ 9	−17	−21	+ 4	+15	+ 2	+ 3	−11	+ 7	− 1	
4	− 3	− 4	−12	−19	−22	+ 7	+ 9	+10	+ 4	+12	+17	
5	− 1	− 3	+15	+ 8	− 3	− 2	+ 9	+11	− 8	+ 4	+ 7	
6	− 5	+ 5	0	+ 8	− 6	+13	+ 3	+19	− 6	+11	+ 4	
7	+ 4	+12	+21	+22	−15	+11	− 1	+ 9	−18	0	− 7	
8	− 8	+19	+ 8	+20	−15	+12	−24	+ 3	−14	+ 4	− 4	
9	−14	−26	+ 2	+ 5	−10	+17	−25	+ 8	−15	− 2	+ 2	
10	−20	+ 3	− 3	+ 5	−23	− 4	−12	+32	− 3	+ 7	+14	
11	−13	+ 8	− 9	+ 4	−19	+ 5	0	+ 6	−38	0	+ 9	
12	− 6	+12	− 1	+20	−20	+19	− 5	+21	− 5	+ 7	+ 7	
13	−13	+ 6	−19	+13	−22	− 3	−15	− 4	−27	− 6	− 8	
14	− 5	+17	− 7	+17	−32	+ 9	− 3	+ 4	− 5	− 1	+ 1	
15	− 6	0	+ 2	+11	−21	+ 4	− 9	− 8	− 4	+ 6	+11	
16	+ 3	+14	− 4	+12	−13	+16	+ 1	+12	+ 6	+17	− 1	

Table VII.

Mean Error of Moon's Longitude for each of 96 *Half-Periods of* 200 *Lunar Days each in Tenths of a Second of Arc.*

	86A to 93B.	94A to 101B.	102A to 109B.	110A to 117B.	118A to 125B.	126A to 133B.
1	+24	+ 4	+ 1	+26	− 1	+13
2	+15	+ 2	+ 3	+17	− 1	+ 9
3	+16	+ 2	+13	+18	− 1	+ 6
4	+13	−13	+10	+17	− 9	− 3
5	+13	− 3	+19	+ 9	+ 2	− 2
6	+ 5	−15	+15	+ 5	0	0
7	+13	−12	+ 6	− 9	0	− 9

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	86A to 93B.	94A to 101B.	102A to 109B.	110A to 117B.	118A to 125B.	126A to 133B.
8	− 1	−17	+ 9	−10	+ 6	− 1
9	+ 4	−29	+ 7	−21	− 3	−11
10	+ 7	−23	+ 6	− 8	+14	−10
11	+ 5	−26	+18	−18	− 1	−13
12	+ 5	−17	+18	− 6	0	− 4
13	+ 3	−18	+11	−19	− 1	− 9
14	+ 5	−12	+20	−11	+ 8	− 2
15	+ 7	− 5	+17	− 7	+18	−10
16	+ 8	0	+14	− 3	+14	− 3

Tables V., VI., VII. give the data for the analyses of Tables III. and IV. Table V. gives for the Airy period 1750 to 1851 the mean error of the Moon's longitude for successive intervals of forty lunar days; the table is, in fact, similar to the one on vol. lxiv. p. 685 for the Hansen period 1847–1901. Numbers in round brackets have been supplied by interpolation in the absence of observations; numbers in square brackets have been substituted for the results of obviously erroneous observations. Tables VI. and VII. refer to the Airy and Hansen periods respectively. The unit is 0″·1 instead of 0″·02 in a similar table on vol. lxiv. p. 691. The errors here given (Tables VI. and VII. only) contain my empirical terms (vol. lxv. November), but, as my empirical terms are of longer period than the terms in Table IV., the results are not affected thereby.

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Table VIII.

Mean Values for Periods 86 *to* 133 *of the Errors of the Moon's Longitude Multiplied by certain Factors in Tenths of a Second of Arc.*

Period.	80^s3.	80^c3.	80^s5.	80^c5.	80^s8.	80^c8.	74^s2.	74^c2.	74^s3.	74^c3.	74^s5.	74^c5.
86	−1	−3	−1	−1	+2	+1	+1	0	+5	+3	−3	−7
87	−6	−2	−1	+1	+1	−1	+3	0	+5	+7	0	+3
88	+2	−16	+2	−2	−1	−1	+1	+1	0	−2	−3	−3
89	+10	−17	0	−4	−5	−8	−2	−1	−5	−4	−4	+1
90	+13	−5	−1	−1	−5	+2	−5	−2	−13	−3	+1	0
91	+14	−4	+1	+1	+2	0	+3	+5	−1	−1	−1	−1
92	+7	+10	+4	0	0	+3	−4	+7	0	+4	−1	0
93	−5	+1	−1	−1	−1	−3	+1	+2	−2	−1	+1	+2
94	−3	+3	0	−1	0	+4	−1	−1	+2	+2	−6	+2
95	−1	−6	+2	0	0	+2	−3	−1	+4	−5	−2	−2
96	+14	−8	−1	−1	−1	−1	0	−2	+6	+2	−4	0
97	+9	0	−2	−1	+2	−2	+2	+5	+3	0	−4	+3
98	+9	+11	−4	−4	−3	−3	−1	+1	+7	+7	−3	+3
99	+3	+11	+6	+1	−2	−2	0	−7	+6	+3	−3	+5
100	−8	0	−1	+2	0	+3	−4	+2	0	0	+3	+6
101	−2	0	+4	−1	+2	−1	−1	+1	−6	0	−4	−1
102	+1	−2	+3	−2	+1	−2	0	+4	−5	−2	+5	+3
103	+6	−1	−2	−1	+1	+1	+2	0	+1	+4	−1	+4
104	+4	+5	+2	+1	+1	−2	0	−1	−4	+7	−1	0
105	0	+10	+1	0	−1	−3	+5	−1	−9	0	−3	−2
106	−5	+7	−3	+4	+1	+1	−1	+3	−4	−6	−1	+2
107	−7	−2	+1	+1	0	−3	0	+4	−3	−7	−3	+6
108	−8	−9	−2	−5	−1	+1	+5	−1	−1	+1	0	0
109	−3	−4	+2	+3	−1	+3	+3	−3	+1	+5	0	+3
110	+4	−2	−2	0	−3	0	+1	+2	0	+2	+1	0
111	+5	−9	+2	+3	−1	−1	+3	−3	+6	−4	−9	+1
112	0	0	−1	0	−2	−3	−3	+3	+5	0	+1	−3
113	−1	+1	0	+2	+1	0	+1	+1	+5	+1	−2	−1
114	+2	−9	+3	0	−1	−2	−3	+5	+5	+4	+2	+2
115	+7	−14	+1	−1	−2	−4	+2	+1	+1	0	+5	0
116	+10	−1	−3	−3	+1	−3	−2	+2	−5	−2	0	+1
117	+7	+1	+2	−1	+3	+4	0	0	−6	−1	+1	+4
118	+10	+5	−2	0	+2	−1	−2	+1	−4	+4	+5	−4
119	−11	+3	+5	+2	+1	+3	+2	+5	+1	+5	+2	+1
120	−11	−8	+5	−2	−2	−1	−2	+2	−4	0	−2	+1
121	0	−9	−2	+2	+2	+1	−1	−4	−3	−3	−1	−6
122	+7	−10	+5	−2	−2	+1	−2	+2	−5	−7	+7	−11
123	+6	−5	0	−2	−3	+4	+5	+1	−1	−2	+3	−2
124	+11	+3	+2	−2	0	0	−2	+2	+4	+1	−1	−1
125	0	+14	−2	−6	−1	+2	0	−2	+1	+6	−2	−2
126	−7	+8	−4	+1	−2	−3	+4	−4	+1	+1	−4	0
127	−8	+3	−1	−1	+2	+4	0	0	+6	+1	−7	−6
128	−3	−5	0	+1	−2	+5	0	+2	0	0	−7	−7
129	+8	−1	+3	+1	−2	0	0	+2	0	+6	0	−3
130	+2	+2	+2	0	0	0	0	0	−4	+2	−5	−5
131	+3	+6	−4	−3	+2	−1	−1	0	−6	+2	−3	−1
132	−4	+8	0	−1	−1	0	0	+1	−2	−3	−3	−2
133	−2	−3	+2	−4	+1	+1	−4	+2	0	−9	−5	−1
ums +	+174	+112	+60	+26	+28	+46	+44	+69	+75	+80	+37	+53
ums −	−96	−155	−40	−53	−45	−51	−44	−33	−93	−62	−98	−71
eneral Sum	+78	−43	+20	−27	−17	−5	0	+36	−18	+18	−61	−18

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Period.	74^s6.	74^c6.	74^s8.	74^c8.	74^s10.	74^c10.	74^s16.	74^c16.	53^s2.	53^c2.	53^s4.	53^c4.
86	−5	−2	−4	+3	−1	+2	−1	+1	−1	−3	−1	+3
87	0	+3	+2	+2	0	+1	+5	0	−4	+6	−2	+8
88	+1	+1	0	+4	−3	+3	+2	0	−17	0	0	−1
89	0	−3	+6	−1	−5	−1	−2	−3	−19	+3	−4	+3
90	+2	−1	+5	+7	0	+3	−4	+3	−14	+2	−7	−1
91	−3	−1	0	−1	+2	0	0	0	−13	+8	+3	−4
92	+2	−1	+2	−1	+3	0	−5	−1	−11	0	+4	−6
93	−1	−1	0	−1	−2	+2	−1	0	−2	−5	+2	0
94	−2	+2	−3	−3	+3	−1	−3	−2	−4	−2	−1	+2
95	+2	−4	+1	−5	+3	−2	+4	+1	+2	−8	−2	+13
96	−2	+1	+5	−4	−4	+3	−2	+4	+11	−11	−4	+2
97	+1	−3	−2	−2	−4	0	0	−4	+7	−7	0	+5
98	+3	−2	+3	+1	0	+4	+3	+2	+12	−7	−6	+3
99	−4	+2	+3	−5	+2	0	+2	+6	+10	−7	−3	−4
100	−1	+1	+4	−2	−2	0	−3	−2	+7	+5	+2	−4
101	−4	+1	−1	−2	0	+2	+1	+1	+3	+1	+7	+5
102	+2	−6	−4	0	−1	−1	0	−3	0	+2	0	+6
103	−2	−2	+1	+5	−2	+1	+2	+3	−1	+6	+4	+5
104	+1	−1	−6	0	+1	0	+2	−2	−5	+6	+1	+7
105	−1	−2	−7	+5	+1	0	−7	+3	−8	+7	−2	+10
106	+1	−4	0	+4	−1	+5	−1	−1	−6	+6	−4	+3
107	−4	+2	+1	+1	+2	−4	−3	−8	−8	+1	−4	0
108	−1	+3	−1	0	−2	−2	+1	0	−11	+3	+3	−6
109	−1	−6	+5	−3	−1	−1	+1	0	−3	+5	0	+4
110	+4	0	+6	−2	+2	+3	+3	+5	−4	−2	+3	−1
111	−1	0	+3	−1	0	−3	−1	−4	−8	0	+9	+2
112	−1	+1	+6	−3	−2	−1	0	−1	+1	0	0	+4
113	+3	−2	+5	0	+3	−1	+1	−1	0	−1	0	+7
114	+1	0	+2	−7	0	+2	+4	0	+9	+2	0	−1
115	+1	+2	+6	−6	0	−1	+1	+2	+15	0	−3	−3
116	−5	+2	+6	−3	−2	0	−1	−1	+9	+5	+4	−3
117	−3	+2	−1	+3	0	+2	+1	0	+7	+1	+4	−1
118	+1	+2	−2	−1	+2	−1	+1	0	+11	−2	+9	+1
119	−2	−2	0	−3	+1	+4	−1	+4	0	+12	0	+1
120	−1	+3	−5	+2	0	+3	+3	−2	−5	+14	+6	+2
121	+4	0	−4	+2	0	−3	+3	−2	−7	+6	+1	−3
122	−2	0	−2	+2	−1	0	−1	+2	−8	+10	−3	−1
123	0	−1	−3	−1	+4	0	+1	0	−3	+9	−6	+1
124	+2	−3	+1	+1	−1	−2	+1	+1	−8	+9	−4	−1
125	+2	−6	−5	+7	0	+2	−4	+4	−13	0	+2	−2
126	+3	0	0	+6	+2	+1	+5	+3	−11	0	+5	−3
127	+3	+1	0	+3	+1	+1	−5	0	−8	0	+5	+2
128	−1	−1	+1	+5	−2	−1	+3	−1	−5	−4	+6	+1
129	0	+3	+5	+1	+2	+1	−1	0	+3	−7	+5	+3
130	+2	−3	+1	0	−3	−1	−1	−2	+1	−2	0	+2
131	0	+1	−1	+3	+3	−1	0	+4	+4	−5	−3	0
132	−1	0	+2	−1	+2	+1	−1	−2	+8	−4	−3	−6
133	+1	+2	+2	−1	−2	−3	−2	+2	+2	+4	+5	−6
Sums +	+42	+35	+84	+67	+39	+46	+50	+51	+122	+133	+90	+105
Sums −	−48	−57	−51	−59	−41	−30	−50	−42	−207	−77	−62	−57
General Sum	−6	−22	+33	+8	−2	+16	0	+9	−85	+56	+28	+48

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Period.	$53^{s}6$.	$53^{c}6$.	$53^{s}8$.	$53^{c}8$.	$53^{s}10$.	$53^{c}10$.	$51^{s}4$.	$51^{c}4$.	$49^{s}7$.	$49^{c}7$.	$49^{s}9$.	$49^{c}9$.
86	+ 3	+ 4	+ 3	0	0	− 2	0	+ 2	− 1	− 1	− 2	+ 2
87	− 2	+ 2	+ 3	− 4	+ 2	− 3	− 2	− 2	+ 2	0	+ 1	+ 2
88	− 2	0	+ 6	+ 2	+ 2	+ 3	0	− 2	− 4	− 3	− 4	+ 3
89	0	− 4	+ 2	0	− 2	+ 4	+ 1	0	− 3	+ 1	− 1	+ 2
90	− 5	0	+ 1	− 1	− 4	0	+ 3	0	+ 2	− 5	0	+ 1
91	− 6	− 2	+ 1	+ 1	− 2	− 4	+ 5	− 3	− 2	− 2	− 5	− 4
92	− 5	+ 3	+ 4	+ 2	+ 1	+ 2	+ 3	+ 1	+ 5	− 3	+ 3	+ 2
93	− 4	+ 1	0	+ 1	+ 2	− 1	+ 1	+ 1	− 2	− 1	− 2	− 2
94	0	− 1	− 4	− 2	− 2	− 1	+ 1	− 1	− 3	0	+ 2	− 3
95	− 6	− 3	+ 3	− 2	− 2	− 1	+ 4	0	− 2	0	+ 1	+ 3
96	+ 3	− 1	+ 4	− 1	− 2	+ 5	0	+ 3	+ 1	+ 4	− 1	− 2
97	+ 2	− 1	+ 2	− 3	+ 1	+ 2	0	+ 2	0	+ 2	+ 2	− 1
98	+ 3	− 7	+ 1	+ 4	+ 2	− 2	− 7	+ 2	− 2	− 4	+ 4	− 3
99	+ 1	− 4	+ 1	+ 6	+ 1	− 1	− 4	+ 6	− 3	+ 1	− 2	+ 2
100	− 1	− 1	0	− 5	0	+ 2	+ 2	+ 1	+ 1	+ 1	+ 4	+ 1
101	− 2	− 3	+ 5	− 4	− 3	+ 2	− 3	− 3	+ 2	− 5	+ 1	− 1
102	+ 5	+ 1	+ 2	+ 2	+ 2	+ 1	− 1	+ 3	− 2	+ 1	0	− 2
103	+ 2	0	− 5	− 1	− 2	+ 2	− 1	− 4	− 1	− 4	− 4	− 2
104	− 4	− 5	0	− 7	− 3	0	− 1	− 1	+ 4	− 1	− 2	− 1
105	− 2	+ 2	+ 3	+ 3	− 1	+ 1	+ 4	+ 1	0	− 4	− 1	+ 5
106	− 3	+ 3	+ 1	+ 4	− 3	− 2	+ 1	0	− 1	− 3	0	+ 1
107	+ 4	0	− 1	0	+ 2	− 1	− 1	0	− 3	− 2	− 1	0
108	− 1	+ 1	− 1	− 1	+ 5	0	− 2	− 1	− 1	+ 1	0	+ 2
109	− 1	0	+ 1	+ 2	− 2	+ 1	+ 3	+ 5	+ 5	+ 1	+ 2	+ 1
110	− 8	0	− 3	+ 5	− 1	+ 2	− 4	− 1	+ 3	+ 3	− 1	− 1
111	− 3	+ 1	− 4	+ 1	0	− 6	− 5	+ 5	+ 6	+ 1	0	− 1
112	− 5	− 3	− 6	− 1	− 3	− 1	0	+ 3	− 1	+ 5	0	− 1
113	− 1	− 6	+ 2	− 2	− 2	− 1	− 5	− 2	− 4	+ 1	− 1	− 1
114	0	− 2	+ 4	− 1	+ 4	0	− 2	0	− 5	− 1	+ 3	− 1
115	− 2	+ 2	− 2	+ 4	− 6	+ 1	+ 2	− 1	− 3	− 6	+ 1	− 2
116	− 2	− 5	− 2	− 1	+ 2	0	− 1	− 3	0	− 2	+ 2	+ 4
117	− 1	+ 2	+ 1	+ 3	− 1	− 2	− 4	− 1	+ 3	− 2	− 1	0
118	+ 2	− 2	+ 1	− 2	+ 1	− 2	+ 3	+ 2	+ 2	− 1	− 3	0
119	+ 2	− 2	+ 1	+ 7	+ 4	+ 2	+ 1	0	+ 3	− 4	− 2	− 1
120	0	+ 1	− 5	+ 2	0	− 2	+ 2	+ 2	+ 1	− 2	0	− 2
121	0	+ 2	+ 1	− 5	+ 2	− 2	0	− 1	+ 1	− 1	+ 2	− 3
122	− 2	− 2	+ 2	+ 7	0	0	− 4	+ 1	− 2	− 1	− 6	+ 1
123	+ 2	− 3	− 3	+ 3	+ 1	− 2	0	0	0	+ 2	0	− 1
124	0	+ 3	− 1	− 3	+ 6	0	+ 1	− 4	0	− 1	+ 1	− 2
125	− 1	+ 5	+ 2	+ 6	+ 7	0	+ 2	+ 5	+ 5	+ 2	− 6	− 4
126	+ 3	0	+ 3	+ 3	− 2	− 1	− 3	+ 3	− 1	− 2	0	0
127	0	+ 3	− 4	+ 3	− 4	+ 3	− 2	0	− 6	− 3	+ 1	− 4
128	− 2	+ 1	− 2	0	0	− 1	0	− 3	− 1	0	+ 5	− 3
129	0	+ 2	+ 1	− 1	− 2	+ 1	+ 1	+ 1	− 2	+ 2	+ 3	0
130	− 2	− 2	+ 2	+ 1	+ 3	+ 3	− 3	0	+ 1	0	− 2	+ 1
131	+ 3	0	+ 1	0	0	− 5	0	− 3	+ 5	0	+ 1	0
132	+ 1	+ 6	+ 4	+ 1	+ 2	− 2	+ 3	− 3	+ 2	− 1	− 2	0
133	− 6	0	− 1	+ 3	− 2	+ 1	− 1	0	+ 5	+ 1	+ 1	− 3
ums +	+ 36	+ 45	+ 68	+ 76	+ 52	+ 38	+ 43	+ 49	+ 59	+ 29	+ 40	+ 32
ums −	− 79	− 59	− 44	− 47	− 51	− 45	− 56	− 39	− 55	− 65	− 49	− 52
eneral Sum	− 43	− 14	+ 24	+ 29	+ 1	− 7	− 13	+ 10	+ 4	− 36	− 9	− 20

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Period.	43^s5.	43^c5.	41^s1.	41^c1.	41^s3.	41^c3.	41^s6.	41^c6.	39^s4.	39^c4.	34^s1.	34^c1.
86	− 2	0	0	+ 2	− 4	− 4	+ 1	+ 5	− 2	+ 8	− 2	+ 1
87	− 1	− 1	− 3	+ 1	+ 1	+ 1	− 1	0	+ 4	− 2	+ 1	+ 1
88	− 3	− 7	+ 4	− 3	+ 7	− 2	− 1	+ 1	− 1	0	− 6	+ 2
89	− 6	+ 3	+ 1	+ 1	+ 1	− 6	− 4	+ 3	+ 2	+ 3	− 4	− 3
90	+ 3	− 1	− 3	− 2	− 4	+ 1	− 1	+ 1	+ 6	− 3	+ 1	+ 1
91	− 1	− 1	0	0	− 7	+ 6	0	+ 1	− 2	+ 1	+ 4	+ 4
92	0	0	+ 1	+ 2	− 4	+ 5	+ 2	− 1	0	+ 1	+ 1	− 7
93	+ 2	+ 3	+ 3	0	+ 1	+ 2	0	+ 1	+ 5	− 7	+ 3	− 5
94	− 3	− 2	+ 2	− 4	− 3	− 4	− 2	0	− 2	0	+ 2	− 2
95	+ 3	+ 1	− 3	0	+ 2	− 4	− 3	+ 2	− 2	0	+ 1	+ 5
96	− 1	+ 6	− 1	0	+ 3	+ 1	− 3	+ 1	− 6	− 2	+ 2	+ 3
97	+ 3	+ 3	+ 1	− 4	+ 5	+ 1	− 1	0	− 1	0	+ 1	0
98	0	− 1	− 1	− 8	− 2	− 5	+ 1	+ 3	+ 2	+ 2	+ 6	+ 3
99	+ 1	+ 3	− 1	+ 5	− 10	− 4	+ 1	+ 1	− 2	+ 3	+ 5	+ 2
100	− 2	+ 3	− 2	− 6	− 6	− 5	− 2	0	0	+ 3	0	+ 1
101	− 7	+ 1	− 1	+ 2	0	− 2	0	0	+ 3	− 2	− 2	+ 3
102	− 5	− 8	0	+ 1	+ 1	+ 1	0	+ 3	+ 5	0	− 5	+ 3
103	+ 1	− 5	− 1	− 4	− 5	+ 2	+ 1	0	− 2	− 3	− 3	+ 3
104	+ 1	− 3	− 1	− 2	− 2	+ 2	+ 2	+ 1	− 1	− 3	+ 2	+ 5
105	+ 2	+ 5	− 3	− 4	+ 4	0	− 3	− 2	− 2	+ 1	− 4	0
106	+ 2	+ 3	− 2	+ 1	+ 2	− 2	− 2	− 1	− 1	+ 2	− 3	+ 1
107	+ 4	− 1	− 3	− 3	+ 5	− 1	+ 1	0	− 9	+ 5	− 2	0
108	+ 1	+ 1	+ 1	+ 3	+ 4	− 3	− 2	+ 1	+ 1	+ 2	− 1	− 1
109	− 1	+ 3	+ 2	− 4	− 4	+ 2	− 1	+ 1	0	+ 3	+ 5	+ 4
110	− 7	+ 1	− 3	+ 1	0	+ 4	+ 2	− 2	+ 4	− 1	+ 1	+ 4
111	0	0	− 3	0	− 3	+ 8	− 4	− 1	− 3	− 2	− 2	− 1
112	− 1	+ 2	− 2	+ 2	+ 4	− 1	− 3	+ 1	0	+ 2	− 6	− 2
113	0	+ 3	− 2	− 2	+ 2	− 1	+ 1	0	− 1	− 3	+ 5	+ 1
114	− 4	− 3	− 1	+ 4	− 3	− 4	+ 1	0	− 6	+ 2	+ 6	− 2
115	+ 2	− 1	− 2	− 3	− 4	+ 3	− 7	− 3	− 3	+ 1	0	0
116	0	− 4	+ 1	− 1	− 1	+ 4	+ 3	+ 7	+ 2	− 1	+ 1	− 1
117	0	+ 4	+ 1	− 1	+ 4	+ 5	+ 1	+ 5	− 4	− 3	+ 1	− 4
118	+ 2	+ 1	0	− 1	− 1	− 5	+ 1	+ 5	− 4	+ 7	+ 2	0
119	0	+ 5	− 4	− 5	0	− 4	− 1	+ 1	+ 2	− 1	+ 2	+ 5
120	+ 2	+ 4	− 1	− 5	+ 5	− 2	+ 3	− 2	+ 4	+ 2	+ 1	+ 3
121	+ 2	− 1	0	0	− 1	− 3	+ 5	0	+ 4	+ 2	− 3	+ 2
122	− 6	− 6	− 7	− 5	− 5	+ 2	0	+ 1	− 4	+ 6	− 1	− 3
123	− 4	0	− 1	+ 1	− 3	+ 5	0	− 3	+ 1	− 2	+ 2	− 2
124	− 4	+ 1	− 5	+ 2	− 1	+ 7	− 1	− 1	− 2	0	+ 2	− 4
125	+ 1	+ 4	− 2	− 3	+ 2	− 1	− 1	− 4	+ 1	− 4	+ 1	+ 2
126	0	− 2	+ 2	+ 4	+ 5	− 8	0	+ 1	− 2	− 2	+ 3	− 1
127	0	+ 2	+ 1	+ 5	− 1	− 1	0	− 6	0	+ 1	− 1	0
128	0	0	− 1	+ 2	0	− 4	− 1	+ 1	− 2	+ 7	+ 4	− 1
129	− 3	− 2	+ 1	+ 2	− 2	0	− 1	0	+ 3	0	0	+ 1
130	+ 1	+ 1	+ 1	0	− 2	+ 1	− 1	− 1	0	+ 1	− 2	− 2
131	0	− 1	0	+ 1	− 2	− 1	− 1	− 2	− 2	− 2	− 1	+ 2
132	+ 4	− 1	− 1	+ 4	− 1	− 1	− 3	0	+ 2	− 2	− 1	− 1
133	+ 1	+ 7	+ 1	+ 1	0	0	0	− 4	− 3	+ 2	+ 8	+ 2
ums +	+ 38	+ 70	+ 23	+ 47	+ 58	+ 63	+ 26	+ 47	+ 51	+ 67	+ 73	+ 64
ums −	− 61	− 51	− 60	− 70	− 81	− 78	− 50	− 33	− 69	− 45	− 49	− 42
eneral Sum	− 23	+ 19	− 37	− 23	− 23	− 15	− 24	+ 14	− 18	+ 22	+ 24	+ 22

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Period.	$34^{s}2$.	$34^{c}2$.	$31^{s}1$.	$31^{c}1$.	$31^{s}2$.	$31^{c}2$.	$31^{s}3$.	$31^{c}3$.	$29^{s}4$.	$29^{c}4$.	$28^{s}5$.	$28^{c}5$.
86	− 2	+ 2	+ 1	− 2	+ 1	− 2	− 1	+ 3	+ 2	+ 5	− 4	0
87	− 2	− 4	− 2	− 1	+ 5	− 5	+ 3	0	0	+ 2	+ 3	− 3
88	0	0	− 2	− 1	− 1	+ 1	0	− 4	− 1	− 1	+ 1	+ 1
89	− 2	+ 2	− 2	− 3	+ 2	0	0	+ 3	− 2	0	− 2	+ 1
90	+ 1	0	− 3	+ 3	0	+ 1	− 5	+ 1	− 6	0	− 1	− 4
91	0	− 2	− 2	+ 2	− 2	+ 3	+ 1	+ 2	+ 3	− 3	0	+ 3
92	+ 2	− 3	+ 2	+ 1	+ 2	− 2	− 4	− 2	0	− 3	0	− 4
93	− 1	0	0	+ 4	− 1	− 2	+ 3	+ 1	+ 2	− 2	0	− 2
94	− 2	+ 1	− 4	+ 5	+ 1	− 2	− 3	− 2	− 2	− 2	+ 2	+ 3
95	− 4	0	− 4	+ 5	− 1	0	− 1	+ 1	+ 3	− 1	0	0
96	+ 2	0	− 1	+ 8	+ 2	− 4	+ 2	− 1	− 1	+ 1	+ 1	− 2
97	+ 1	+ 3	− 9	+ 4	− 1	− 2	− 5	+ 2	+ 2	− 1	+ 2	0
98	− 4	+ 1	− 6	+ 2	+ 1	− 6	+ 2	− 3	− 2	0	+ 1	+ 1
99	− 4	0	− 9	− 1	+ 3	− 2	+ 4	+ 2	− 3	− 3	0	+ 3
100	+ 3	− 1	− 6	− 4	− 1	− 1	0	− 1	− 1	− 2	− 1	+ 1
101	+ 4	− 3	+ 2	− 5	0	0	+ 4	− 1	+ 3	+ 2	+ 3	+ 2
102	− 2	+ 1	+ 2	− 4	0	+ 6	+ 2	+ 1	+ 2	− 3	− 1	+ 2
103	0	+ 1	+ 6	− 1	+ 1	+ 2	+ 4	+ 1	− 2	− 5	− 3	+ 1
104	+ 3	− 2	+ 4	− 3	− 1	− 2	+ 1	− 2	+ 1	− 1	− 1	− 1
105	+ 3	+ 1	− 3	+ 4	+ 4	+ 2	+ 4	+ 2	+ 4	− 2	− 4	− 2
106	0	0	− 4	− 1	+ 1	− 1	0	− 1	0	− 2	0	+ 1
107	+ 2	+ 2	+ 3	− 4	0	− 3	+ 3	0	− 2	− 2	+ 8	+ 2
108	− 2	+ 1	+ 1	− 5	+ 1	− 4	0	0	− 2	0	+ 1	+ 1
109	+ 1	− 1	+ 5	0	− 3	0	+ 1	− 3	− 1	0	0	+ 7
110	+ 4	+ 4	+ 1	0	− 1	− 6	0	+ 2	+ 1	− 1	+ 4	0
111	0	0	+ 8	+ 7	+ 1	+ 3	+ 2	0	0	+ 1	+ 1	− 1
112	+ 2	− 4	− 2	+ 4	+ 6	+ 2	− 4	− 2	0	+ 3	− 3	− 3
113	0	+ 2	− 2	0	− 2	0	0	+ 1	− 1	+ 1	− 2	0
114	+ 3	− 1	+ 3	+ 1	− 6	− 1	+ 1	+ 2	+ 4	− 4	+ 1	0
115	+ 2	+ 2	− 2	0	− 6	− 3	+ 1	+ 2	+ 1	0	+ 2	0
116	− 6	− 2	− 6	− 5	− 1	+ 2	− 1	+ 1	− 1	+ 8	+ 1	+ 1
117	0	0	− 3	+ 2	− 3	+ 5	+ 1	0	+ 1	− 1	+ 3	+ 2
118	0	+ 2	+ 2	− 2	+ 2	0	− 3	+ 1	+ 3	− 1	− 3	0
119	0	− 7	+ 2	+ 2	0	− 2	− 2	− 1	+ 2	− 1	− 2	+ 3
120	+ 2	+ 6	+ 1	0	− 4	− 3	+ 4	0	+ 5	+ 1	+ 3	− 2
121	+ 2	0	0	+ 5	− 1	− 1	+ 1	+ 2	0	− 1	+ 2	+ 1
122	− 2	0	− 7	− 2	+ 2	− 4	+ 2	− 2	0	+ 3	+ 3	− 1
123	− 2	0	− 7	− 3	+ 3	+ 2	− 4	+ 2	− 3	+ 2	0	+ 1
124	0	− 2	− 10	− 1	+ 4	+ 4	+ 3	+ 1	0	+ 2	0	− 1
125	+ 2	+ 8	− 4	− 4	0	0	+ 3	+ 5	+ 1	− 2	+ 2	− 2
126	0	0	− 1	− 10	+ 1	− 2	+ 2	− 4	+ 1	− 2	+ 5	+ 3
127	+ 1	− 1	+ 6	− 6	+ 1	+ 2	− 2	− 3	− 1	0	+ 2	− 2
128	− 2	0	+ 3	− 4	− 2	− 3	− 3	− 2	+ 2	0	+ 2	0
129	0	+ 2	+ 2	+ 3	− 2	0	0	− 6	− 1	+ 1	0	0
130	− 2	− 2	+ 4	+ 3	+ 1	0	+ 3	+ 1	− 2	+ 2	0	0
131	+ 2	0	+ 5	+ 4	− 1	− 1	+ 4	− 1	+ 4	+ 2	0	+ 4
132	+ 3	+ 3	− 6	+ 7	− 1	0	+ 1	0	− 1	− 1	+ 1	− 2
133	− 1	+ 3	− 6	+ 1	+ 4	+ 2	− 2	− 2	0	− 2	+ 2	− 2
Sums +	+ 45	+ 47	+ 63	+ 77	+ 49	+ 37	+ 62	+ 39	+ 47	+ 36	+ 56	+ 44
Sums −	− 40	− 35	− 113	− 72	− 41	− 64	− 40	− 43	− 35	− 49	− 27	− 34
General Sum	+ 5	+ 12	− 50	+ 5	+ 8	− 27	+ 22	− 4	+ 12	− 13	+ 29	+ 10

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Period.	$27^{s}3$.	$27^{c}3$.	$27^{s}4$.	$27^{c}4$.	$27^{s}6$.	$27^{c}6$.	$23^{s}1$.	$23^{c}1$.	$23^{s}4$.	$23^{c}4$.	$22^{s}1$.	$22^{c}1$.
86	0	+3	0	−5	−5	−2	+3	+3	+1	0	−2	+3
87	+2	−9	+2	+1	+4	−3	−5	−1	+4	−1	+5	+3
88	−3	−5	−4	+2	+3	−3	+4	+2	−4	−5	+3	+1
89	−2	+1	−1	−2	+2	−3	+4	0	0	+2	−1	−1
90	0	+4	−2	+1	+3	+1	+3	−6	−3	+1	+2	0
91	−2	+1	+1	+5	+5	+2	−1	−2	+1	−5	−1	0
92	−2	+5	−3	+2	−1	−3	−5	+1	−1	+2	0	−2
93	+4	+1	−2	+3	−2	−3	−4	−1	+2	−1	+3	−3
94	−1	−1	+1	−7	+1	−2	0	0	−1	−1	−1	−1
95	−1	−6	−3	−3	+1	+1	−4	+3	+2	−2	−2	−1
96	−6	−4	+1	+3	−2	−5	−4	+1	+1	0	−2	−1
97	−4	+2	0	+3	+1	+2	−2	+1	+3	−2	+2	+3
98	0	+4	−2	−6	+6	0	+6	0	−3	0	−1	−1
99	0	+3	+5	−1	+1	0	−3	−5	+1	−2	+1	+2
100	0	+1	+3	−1	+1	−2	−2	+3	−1	+4	−2	−4
101	−1	+4	+1	−1	+1	−2	−2	−2	−2	0	−3	+1
102	0	+1	0	+5	+1	−1	−3	−3	+3	−2	0	−1
103	+1	−4	0	+1	+3	0	+3	−2	0	+1	−1	0
104	−1	−2	+4	+5	+1	+2	+1	+2	−3	+2	+1	0
105	−4	+2	+1	+5	−1	0	0	+4	0	−6	+2	+3
106	−2	+5	+1	−3	0	+2	+2	−2	−1	+1	−2	+2
107	−3	−1	−4	0	+4	+5	+2	+1	+2	−1	−3	+4
108	−3	+2	+2	−1	+3	−2	−6	−4	−3	−1	+2	+2
109	0	−1	+3	−1	0	+1	+5	+3	+7	+6	+1	0
110	+5	−2	0	+6	+1	+2	+3	+2	−2	+2	0	+1
111	+3	−5	+1	−1	+2	+3	+5	+1	−1	+1	0	+1
112	+1	−3	−2	+1	−2	−1	+2	−3	−3	0	+1	+1
113	−5	0	−4	+1	+1	+2	0	+1	−2	0	−2	0
114	−4	+1	−2	0	−2	+4	0	−1	0	+3	−1	+3
115	−4	−3	0	−6	+3	+2	+1	+3	+1	0	−1	−2
116	−10	−4	−4	−2	+1	+2	−4	+5	+3	+1	+7	0
117	−2	−3	−1	+1	−2	0	+1	+2	+2	−2	−3	+1
118	+1	+3	+1	0	−1	−2	+1	+2	+2	−2	+2	0
119	+1	+4	+1	+1	−5	−1	+3	+3	−5	−3	+3	+5
120	0	−4	−2	−3	+4	−2	+2	+2	−4	0	−1	−1
121	−1	+2	+2	0	−3	+4	−2	+3	+3	+3	+1	+1
122	+3	−1	−4	−3	−4	0	−7	+1	+6	−10	−5	−1
123	−3	−4	+7	+4	+1	0	0	−3	−3	+2	+1	+1
124	−2	+3	−2	+1	0	+1	+2	0	+3	+3	0	0
125	−1	+1	−6	−3	+2	−1	−9	+5	0	+2	+3	+1
126	+2	+3	0	−2	0	0	+1	−3	+2	−4	0	−4
127	+3	+3	+3	0	−1	−3	+3	−1	0	−3	0	0
128	0	−6	−3	+2	0	−2	+3	+3	−3	+4	+4	+3
129	−2	−3	+2	−2	+1	−2	−2	+1	+2	−3	+1	0
130	0	0	+1	+1	−1	−1	+2	+2	0	+2	+2	−4
131	0	−1	+2	+1	0	−1	+1	+2	0	+2	−2	+2
132	−2	+1	−1	−1	+3	−2	−2	0	−2	+2	0	+1
133	−1	+3	+2	+2	+1	−5	−3	+2	−3	−1	−4	−1
Sums +	+26	+63	+47	+57	+61	+36	+63	+64	+51	+46	+47	+45
Sums −	−72	−72	−52	−54	−32	−54	−70	−39	−50	−57	−40	−28
General Sum	−46	−9	−5	+3	+29	−18	−7	+25	+1	−11	+7	+17

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Period.	sin D.	cos. D.	sin 2D.	cos 2D.	sin 3D.	cos 3D.	sin 4D.	cos 4D.	sin 5D.	cos 5D.	μ.	No. of Obs.
86	+3	−8	+1	−2	−1	0	+1	0	0	+1	−1	118
87	+2	−2	−10	0	0	0	+7	+2	−2	−2	−13	134
88	+9	−16	+1	−4	−4	+2	0	+1	+1	−3	−7	123
89	0	−3	0	+3	0	−5	0	+4	+2	+1	0	121
90	+2	−6	−1	+1	−4	+2	+5	−6	+1	+3	−6	126
91	+5	+8	0	+6	−1	−1	−1	−1	+2	+1	0	130
92	−8	−2	+3	+1	0	+1	−1	−4	+1	0	+2	128
93	+13	0	+4	+5	−8	−3	+5	+2	−1	−2	−9	109
94	−4	−1	−4	−1	0	−2	+5	+4	−2	−3	−2	109
95	−4	+6	−1	−1	0	+2	+5	−1	−2	0	−4	138
96	−6	−19	−3	−15	−1	+7	+3	0	−3	−3	−5	140
97	+9	+8	+1	+2	−4	−2	+5	−1	−2	+3	−16	135
98	−5	+11	0	+8	−3	−2	+4	−3	−1	+2	−2	119
99	−6	−5	+2	−1	−1	+2	−1	−3	+5	−1	+5	111
100	+1	−2	−4	+1	+3	0	−3	−2	+4	−2	+1	123
101	−6	−1	+1	−1	−1	+3	+1	−2	+3	−1	+4	125
102	+1	+3	−4	−5	+1	+5	0	+1	+1	−3	+1	124
103	+1	+10	−2	+6	−1	−3	+5	+2	0	−1	+2	108
104	−12	+4	+3	+3	+1	−1	−2	−2	+2	+4	+6	128
105	−4	−5	+5	−1	−4	+2	0	−2	+4	−2	+5	116
106	+9	+6	0	+2	−2	−2	0	0	+2	−1	−5	121
107	+3	+8	+1	+2	−2	−1	0	+1	+1	0	−1	116
108	+1	+6	+5	+2	+2	0	−3	−4	0	+4	+5	123
109	+10	0	+3	0	−5	+2	−2	−4	+7	+4	+2	114
110	−11	−3	+1	−2	+5	−2	−5	+4	+1	−2	+11	125
111	−1	−2	−3	+1	+2	+1	+1	−4	−2	+4	−3	96
112	−6	0	+1	+5	+2	−4	−2	+2	0	+1	+4	104
113	+5	+10	−4	+6	0	−3	+2	0	0	+2	−4	115
114	+3	−13	−4	−1	+2	+3	0	−7	−1	+3	−2	93
115	−7	−4	+5	+4	+1	−2	−3	0	+1	−2	+10	115
116	−5	−22	−2	−5	0	+4	0	−4	+3	+2	+6	115
117	−7	−4	−1	+2	+3	0	0	−2	−2	−1	+8	113
118	0	−2	+1	0	0	0	0	+3	0	−5	+4	117
119	+5	+4	−6	−2	−1	0	+4	−1	+1	+2	−5	114
120	+2	−13	−5	−7	0	+6	0	−3	+2	−3	−3	100
121	+4	+4	+4	+3	−1	0	−3	−2	+2	−1	+2	120
122	+6	−6	+3	−2	−2	0	−1	0	+4	−3	+5	84
123	+6	−2	−1	0	−2	−1	+1	+3	+3	−3	−1	91
124	+5	−3	0	+3	0	−2	−2	+2	+2	0	0	114
125	+1	−3	−8	+3	−1	−3	+7	+4	0	+2	−3	90
126	−3	−1	−2	−1	−2	0	+5	+2	−2	−2	−3	134
127	−4	+3	0	+6	0	−3	−1	+1	+3	−1	+4	120
128	−6	−4	+1	−3	−2	+4	+2	−3	0	0	+4	127
129	+7	−5	0	−1	−5	0	+3	−1	+1	+3	−9	128
130	−5	−12	0	−5	−1	+3	0	−1	+1	−1	0	112
131	+4	−5	−1	−1	−3	−1	+4	0	−3	+2	−8	123
132	−3	−2	−1	+1	0	0	0	+1	+1	−1	+1	133
133	−5	+17	+4	+10	−1	−2	−1	−1	0	−3	+4	124
Sums +	+117	+108	+50	+86	+22	+49	+75	+39	+61	+44	+96	
Sums −	−118	−176	−67	−61	−63	−45	−31	−64	−23	−52	−112	
General Sum	−1	−68	−17	+25	−41	+4	+44	−25	+38	−8	−16	5646

TABLE IX.

Mean Values for Periods 1 *to* 89 *of the Errors of the Moon's Longitude multiplied by Certain Factors in Tenths of a Second of Arc.*

Period.	80^s3.	80^c3.	53^s2.	53^c2.	53^s4.	53^c4.	53^s6.	53^c6.	53^s8.	53^c8.
1	+ 10	+ 10	+ 14	+ 5	0	− 10	+ 2	− 7	− 6	− 1
2	− 8	+ 16	+ 11	+ 14	− 9	− 3	− 6	+ 9	− 8	− 10
3	− 15	+ 18	+ 18	+ 11	+ 8	+ 1	+ 6	+ 6	0	− 8
4	− 6	− 3	+ 2	+ 7	− 5	+ 6	+ 2	+ 3	+ 7	− 4
5	− 4	− 6	0	+ 4	+ 12	− 4	− 8	+ 1	− 5	+ 5
6	+ 2	− 16	− 1	+ 15	− 1	+ 4	+ 2	0	− 1	+ 5
7	+ 6	− 18	+ 7	+ 19	− 13	+ 9	+ 3	+ 5	− 2	+ 2
8	0	− 16	+ 15	+ 5	− 2	+ 3	+ 2	+ 5	+ 7	+ 2
9	− 4	− 11	+ 6	− 5	− 9	+ 8	− 9	+ 5	− 2	+ 10
10	− 7	+ 3	− 6	− 2	− 4	+ 6	+ 1	+ 7	+ 2	+ 9
11	− 15	− 20	− 16	− 17	+ 10	− 6	− 12	− 9	+ 3	− 13
12	+ 10	− 9	+ 4	− 15	+ 13	+ 10	0	+ 9	− 1	− 21
13	+ 5	− 20	− 15	− 12	+ 2	+ 11	+ 4	+ 7	+ 11	+ 8
14	+ 8	− 9	− 9	− 10	+ 4	+ 14	+ 4	0	+ 3	+ 1
15	+ 7	− 1	− 5	− 4	− 7	+ 17	0	− 1	− 1	+ 1
16	− 6	+ 7	+ 7	− 7	0	+ 5	+ 2	− 18	+ 2	− 2
17	− 7	− 4	+ 8	+ 3	− 4	+ 4	+ 10	− 6	+ 9	0
18	+ 2	− 1	+ 1	+ 3	− 3	− 3	− 1	− 5	0	+ 1
19	− 4	− 11	+ 10	− 6	+ 7	+ 2	− 8	+ 8	− 11	+ 6
20	− 13	− 2	− 5	− 11	+ 14	+ 9	− 5	+ 6	+ 5	− 6
21	− 1	− 6	0	− 7	− 2	− 3	+ 4	− 5	+ 6	− 4
22	+ 8	+ 8	+ 10	+ 6	+ 4	+ 11	− 2	− 5	+ 7	0
23	+ 12	+ 14	+ 21	− 2	− 1	+ 13	+ 2	− 3	− 11	− 6
24	+ 7	+ 19	+ 22	− 5	+ 4	+ 2	− 4	+ 9	+ 3	− 1
25	− 2	+ 20	+ 19	− 9	+ 4	− 1	− 6	+ 4	+ 11	+ 4
26	− 10	+ 4	+ 13	+ 1	+ 7	+ 10	− 3	+ 5	− 2	+ 5
27	+ 8	− 17	− 4	+ 19	+ 2	+ 1	0	− 1	− 3	− 1
28	+ 2	+ 2	− 1	− 4	+ 14	+ 4	0	+ 4	+ 1	− 3
29	+ 6	− 5	+ 5	+ 5	+ 1	+ 1	− 1	− 3	+ 2	0
30	+ 4	− 4	+ 4	0	+ 6	+ 7	0	− 5	− 1	+ 2
31	+ 14	0	+ 9	+ 5	+ 1	+ 9	− 2	− 1	− 3	+ 2
32	− 2	+ 15	− 4	+ 15	+ 1	+ 3	− 4	− 2	− 6	0
33	+ 18	+ 2	+ 13	− 5	+ 9	− 1	− 5	− 4	+ 5	+ 4
34	− 11	− 9	− 16	+ 8	− 7	+ 14	+ 9	− 2	+ 9	− 9
35	− 1	+ 2	0	+ 2	− 3	− 6	+ 1	− 8	− 3	+ 6
36	+ 9	− 1	− 7	− 4	+ 4	− 3	− 4	+ 12	− 2	− 2
37	+ 3	+ 7	0	− 6	− 6	+ 1	− 7	+ 10	+ 3	− 6
38	+ 12	+ 2	− 10	+ 4	− 1	0	− 2	− 7	+ 11	+ 3
39	+ 1	0	+ 1	+ 2	− 9	+ 1	− 4	+ 3	+ 7	+ 6
40	− 14	+ 9	− 9	− 15	+ 1	− 9	+ 5	0	− 8	+ 2
41	− 30	+ 1	− 15	− 28	+ 7	− 1	+ 8	0	− 1	− 6
42	− 17	− 1	− 14	− 11	+ 8	+ 8	+ 10	0	− 1	0
43	+ 1	− 10	− 1	− 13	+ 4	− 10	− 17	+ 1	0	− 9
44	0	− 9	− 8	− 10	− 4	+ 3	− 11	+ 7	− 3	+ 7
45	+ 15	− 3	− 1	− 16	− 13	− 1	+ 10	+ 5	− 1	+ 1
46	+ 12	+ 11	+ 4	− 16	+ 2	− 2	− 7	+ 5	+ 4	+ 3
47	− 4	+ 33	+ 18	− 25	− 3	− 5	− 3	+ 1	+ 11	− 2
48	− 22	+ 13	+ 19	− 10	+ 2	− 4	− 4	+ 1	+ 2	− 1
ums +	+ 182	+ 216	+ 261	+ 153	+ 151	+ 197	+ 87	+ 138	+ 131	+ 95
ums −	− 203	− 212	− 147	− 275	− 106	− 72	− 135	− 92	− 82	− 115
eneral Sum	− 21	+ 4	+ 114	− 122	+ 45	+ 125	− 48	+ 46	+ 49	− 20

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Period.	53^s10.	53^c10.	$\sin g$.	$\cos g$.	Period.	80^s3.	80^c3.	53^s2.	53^c2.
1	+ 4	+ 7	− 2	+ 15	49	− 14	− 4	+ 13	0
2	− 12	− 5	− 16	+ 8	50	− 8	− 3	+ 6	− 3
3	+ 2	− 5	− 20	+ 8	51	+ 5	0	+ 5	+ 7
4	+ 1	+ 4	− 5	− 5	52	+ 10	+ 9	+ 3	+ 16
5	+ 10	+ 3	0	− 4	53	− 7	+ 26	− 9	+ 22
6	− 2	+ 2	+ 7	− 13	54	− 9	+ 2	− 8	+ 4
7	− 6	− 9	+ 8	− 18	55	− 7	− 12	− 14	0
8	− 3	+ 2	0	− 16	56	+ 3	− 7	− 8	− 3
9	− 1	+ 1	− 4	− 6	57	+ 18	− 17	− 25	− 5
10	0	− 6	− 5	+ 4	58	+ 4	− 3	− 5	+ 1
11	+ 4	− 15	− 23	− 4	59	+ 4	+ 2	− 6	− 1
12	− 2	+ 4	+ 1	− 16	60	− 5	+ 13	− 7	− 11
13	+ 4	− 4	− 11	− 16	61	− 21	− 12	+ 14	− 20
14	− 2	+ 1	0	− 14	62	− 6	− 12	+ 9	− 12
15	− 2	0	+ 2	− 6	63	− 3	− 24	+ 9	− 24
16	− 1	+ 5	+ 7	+ 7	64	+ 4	− 32	+ 4	− 35
17	− 5	+ 1	− 6	+ 6	65	+ 18	− 20	+ 1	− 26
18	+ 3	− 3	− 3	− 2	66	+ 7	− 20	− 15	− 14
19	+ 1	0	− 8	+ 9	67	+ 12	− 7	− 11	− 8
20	− 11	− 4	+ 3	+ 12	68	− 2	− 14	− 8	+ 13
21	− 3	− 8	− 4	+ 6	69	+ 1	− 21	− 3	+ 21
22	+ 7	− 2	0	− 12	70	+ 7	− 16	− 1	+ 19
23	+ 5	− 1	− 4	− 21	71	+ 23	− 16	+ 4	+ 29
24	0	+ 7	+ 2	− 21	72	+ 21	+ 3	− 1	+ 22
25	0	+ 11	+ 6	− 21	73	+ 8	+ 25	− 14	+ 21
26	+ 3	+ 5	+ 12	− 4	74	+ 1	+ 5	0	+ 4
27	+ 6	0	− 6	+ 19	75	− 4	− 11	− 7	− 8
28	+ 2	0	+ 1	− 4	76	+ 6	− 27	− 16	− 22
29	− 1	− 2	− 1	+ 7	77	+ 19	− 9	− 8	− 21
30	+ 9	+ 1	+ 1	+ 4	78	+ 20	+ 1	− 9	− 18
31	+ 4	− 2	− 7	+ 8	79	+ 27	+ 18	− 17	− 26
32	− 6	0	− 10	− 12	80	+ 14	+ 23	− 14	− 20
33	− 4	− 3	− 9	+ 11	81	+ 16	+ 33	− 34	− 14
34	+ 10	− 1	+ 15	− 10	82	+ 7	+ 34	− 34	− 3
35	+ 3	− 1	+ 1	− 2	83	0	+ 19	− 17	+ 4
36	− 1	+ 4	+ 2	+ 8	84	+ 7	+ 20	− 5	+ 19
37	− 7	+ 2	− 5	+ 2	85	+ 5	+ 26	+ 2	+ 24
38	0	− 6	+ 3	+ 10	86	− 1	+ 13	+ 7	+ 11
39	− 6	+ 7	+ 2	0	87	− 8	+ 12	+ 6	+ 12
40	+ 3	+ 4	− 16	− 7	88	− 14	+ 1	+ 2	+ 14
41	− 2	+ 5	− 21	− 25	89	− 8	+ 1	+ 5	+ 4
42	− 8	− 3	− 11	− 15					
43	− 4	+ 7	+ 7	− 11					
44	− 4	+ 4	+ 6	− 11					
45	+ 4	0	+ 16	− 1					
46	+ 3	0	+ 13	+ 10					
47	0	+ 1	+ 3	+ 32					
48	− 3	− 6	− 16	+ 16					
Sums +	+ 88	+ 88	+ 118	+ 202		+ 267	+ 286	+ 90	+ 267
Sums −	− 96	− 86	− 213	− 297		− 117	− 287	− 296	− 294
General Sum	− 8	+ 2	− 95	− 95		+ 150	− 1	− 206	− 27

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Period.	$53^{s}4$.	$53^{c}4$.	$53^{s}6$.	$53^{c}6$.	$53^{s}8$.	$53^{c}8$.	$53^{s}10$.	$53^{c}10$.	sin *g*.	cos *g*.
49	+ 8	− 3	+ 5	− 3	− 4	+ 4	− 6	− 3	− 13	− 1
50	+ 5	+ 3	− 3	− 3	− 2	− 7	− 4	0	− 6	− 1
51	− 2	− 6	+ 7	0	− 1	+ 6	+ 3	− 7	+ 3	− 7
52	+ 14	− 5	− 1	+ 9	+ 7	+ 1	− 6	0	+ 16	− 5
53	− 15	+ 7	− 4	+ 2	+ 4	− 6	+ 9	− 4	+ 19	+ 16
54	+ 1	− 2	− 7	0	+ 2	− 4	+ 7	− 2	− 2	+ 9
55	− 1	− 1	+ 2	+ 4	+ 5	+ 4	− 3	+ 6	− 13	+ 6
56	− 13	− 7	− 6	− 11	+ 5	− 6	+ 4	− 4	− 8	− 3
57	− 3	− 10	+ 7	− 7	− 6	− 8	− 6	0	− 20	− 14
58	+ 13	− 6	+ 3	+ 1	+ 9	+ 1	+ 2	+ 1	− 4	− 3
59	− 2	− 10	− 2	− 3	− 2	− 1	+ 9	+ 5	0	− 6
60	+ 5	+ 2	+ 1	+ 3	+ 4	+ 1	+ 3	+ 7	+ 12	− 5
61	− 3	+ 2	+ 7	+ 7	+ 1	0	+ 1	+ 1	+ 8	+ 23
62	− 4	− 1	+ 9	+ 10	− 5	− 7	− 7	+ 6	− 2	+ 15
63	− 1	− 5	+ 3	+ 3	+ 2	− 3	− 1	− 4	− 7	+ 25
64	− 2	− 7	− 3	+ 10	− 4	− 5	− 5	0	− 14	+ 30
65	0	− 8	− 2	+ 6	− 6	+ 10	− 5	− 1	− 19	+ 17
66	− 12	0	− 10	− 2	− 4	− 5	+ 1	+ 5	− 8	+ 18
67	+ 6	− 11	+ 3	− 4	− 1	− 3	+ 1	+ 2	− 9	+ 10
68	− 4	+ 4	+ 4	0	+ 2	0	0	− 8	+ 8	+ 14
69	+ 1	+ 11	− 2	0	0	− 1	− 6	− 4	+ 10	+ 19
70	0	0	0	+ 6	− 7	+ 1	+ 4	− 6	+ 5	+ 17
71	− 5	− 3	− 6	0	+ 1	− 2	+ 4	− 2	− 2	+ 30
72	− 8	+ 2	− 3	− 2	0	+ 1	− 4	+ 7	− 14	+ 17
73	− 2	− 17	− 6	+ 4	+ 3	+ 2	− 3	+ 7	− 24	− 4
74	− 9	− 2	+ 2	− 5	− 3	0	+ 12	+ 3	− 4	0
75	+ 3	− 4	+ 11	+ 13	− 7	− 4	− 1	− 3	+ 10	− 3
76	+ 3	− 4	− 11	+ 8	− 2	0	+ 3	− 3	+ 26	+ 4
77	+ 3	+ 6	− 1	− 3	− 1	0	0	+ 2	+ 14	+ 19
78	0	− 1	+ 7	− 1	0	− 1	− 4	− 2	+ 7	+ 19
79	− 1	+ 1	− 2	− 1	− 2	+ 8	− 3	+ 4	+ 1	+ 29
80	− 12	− 4	+ 7	− 1	− 2	+ 4	− 4	− 6	− 9	+ 21
81	− 6	− 7	+ 16	− 8	+ 2	− 2	− 2	− 3	− 11	+ 35
82	− 20	− 7	− 4	+ 4	+ 3	− 2	+ 1	+ 12	− 13	+ 33
83	− 7	− 7	− 3	+ 6	0	+ 1	+ 1	+ 4	− 9	+ 16
84	+ 9	+ 7	− 3	− 4	+ 2	− 7	− 4	+ 2	+ 3	+ 19
85	+ 2	+ 5	+ 4	+ 1	+ 5	− 2	+ 2	+ 3	+ 2	+ 24
86	− 1	+ 3	+ 3	+ 4	+ 6	− 1	+ 2	− 2	+ 2	+ 13
87	− 4	+ 7	− 5	0	+ 1	− 1	+ 4	− 5	− 6	+ 12
88	− 7	− 2	− 1	+ 5	+ 4	+ 4	0	+ 2	− 13	+ 6
89	− 8	+ 1	− 1	+ 5	− 1	0	+ 3	+ 6	− 5	+ 4
Sums +	+ 73	+ 61	+ 101	+ 111	+ 68	+ 48	+ 76	+ 85	+ 146	+ 520
Sums −	− 152	− 140	− 86	− 58	− 60	− 78	− 74	− 69	− 235	− 52
General Sum	− 79	− 79	+ 15	+ 53	+ 8	− 30	+ 2	+ 16	− 89	+ 468

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It is clearly impossible to give the individual observations. Table VIII. (1847 to 1901) and Table IX. (1750 to 1851), however, give for each period of analysis the mean for each period of the product of each error by certain factors. In the column headed ${}_{m}s_{n}$ the factor is $2 \sin {}_{m}A_{n}$; similarly for ${}_{m}c_{n}$ the factor is $2 \cos {}_{m}A_{n}$. Columns headed $\sin D$, $\cos D$, $\sin 2D$, $\cos 2D$ and μ, are copied from lxiv. p. 580, and the method of their calculation is there explained. Columns headed $\sin g$, $\cos g$, are found in this way. From Table II., No. 23, the values of $g - {}_{53}A_2$ may be calculated for the middle of each period. Let $(g - {}_{53}A_2)_0$ denote the value of $g - {}_{53}A_2$ at the middle of a period ; then

$$(g - {}_{53}A_2)_0 = (g - {}_{53}A_2) - k\theta$$

when 2θ is given in the last column of Table II. (in this instance $\theta = -12°4$), and k moves uniformly through a period of analysis from -1 to $+1$.

Now the columns headed $\sin g$, $\cos g$ (Table IX.), are derived from those headed ${}_{53}s_2$, ${}_{53}c_2$, thus :

$$(\sin g) = ({}_{53}c_2) \sin (g - {}_{53}A_2)_0 + ({}_{53}s_2) \cos (g - {}_{53}A_2)_0$$
$$(\cos g) = ({}_{53}c_2) \cos (g - {}_{53}A_2)_0 - ({}_{53}s_2) \sin (g - {}_{53}A_2)_0$$

Referring to the definitions of the columns headed ${}_{53}s_2$ and ${}_{53}c_2$, it will be seen that the definition of the columns headed $\sin g$ and $\cos g$ are "mean values of the products of the errors by $2 \sin (g - k\theta)$ and $2 \cos (g - k\theta)$ respectively."

Now if θ were zero, and if we take means for a very large number of periods, then the means so arrived at are the coefficients of $\sin g$ and $\cos g$ in the errors, affected (i.) by purely accidental errors of observation, (ii.) by systematic errors (α) due to terms differing very slightly from g in mean motion, $g + \phi$ say, where ϕ is small. Systematic errors from this cause disappear if means are taken over a complete revolution of ϕ, and for solar terms the smallest value of ϕ is $\omega - \omega'$ whose period is 9 years ; consequently in 50 years there is no systematic effect from any solar term (β) due to terms $g \pm D$. This effect is due to the distribution of observations about full moon, and can be approximately allowed for by remarking that the mean value of $\cos D$ is $-\frac{1}{2}$ (γ) due to terms $g \pm D + \phi$, a combination of causes (α) and (β) disappearing in process of time like (α).

Lastly, since θ is not zero, the results are diminished by the factor "mean value of $\cos k\theta$," o $\frac{\sin \theta}{\theta}$. Conversely, in forming an estimate of the error of the tabular term, the results arrived at must be increased by the factor $\frac{\theta}{\sin \theta}$.

Coefficients of $\sin g$ and $\cos g$ derived with the help of the auxiliary angle ${}_{53}A_2$ have, by an oversight, not been printed in Table VIII. They have been compared with the last two

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columns on lxiv. p. 415, which have been derived with the help of the auxiliary angle ${}_{80}A_3$. There is an error of sign on that page for sin g, period 98 ; otherwise there is a close agreement between the two sets of figures. As the arithmetic of the two analyses is absolutely different, the check afforded by the comparison is a very thorough one.

As at the present time theory is defective, as regards long-period terms, it is probable that more theoretical short-period terms will from time to time be discovered. Table VIII. will in all probability suffice to compare such terms with observation. Meanwhile Table VIII. is evidence that there are not any unknown short-period terms with coefficients approaching to $0''\cdot5$ and with arguments at all approximating to any of the auxiliary angles, with the possible exception of ${}_{53}A_2$, the angle associated with the mean anomaly.

In Table X. I complete my analysis for the terms that I have selected. The first column contains the reference number. The second column contains the argument associated with that reference number in Table II., III., or IV. In the case of solar terms the argument is written in a second form, suggested by the consideration of systematic errors (β) mentioned above. The order of terms is arranged thus : first the solar terms were put into groups, the members of the same group differing by multiples of D only, and the groups being arranged according to the part of the second form which is independent of D, the smallest mean motions being put first ; next the planetary terms were put in ; a few whose mean motions were nearly the same as solar terms were put near to those solar terms. The difference of mean motion in these cases is never greater than 20° in one period of analysis. When the difference is less than 7° a bracket has been put connecting the terms. In such cases even 50 years do not suffice thoroughly to disentangle the two terms, but there are only five brackets, one embracing three terms, to be considered. In the third line of the second column the value of $\frac{\theta}{\sin\theta}$ is given, 2θ being given in Table II. for the short-period terms. By this factor the coefficients in the next two columns must be multiplied before use.

The third and fourth columns give the "apparent" tabular minus observed coefficients of the sine and cosine of the argument. I say "apparent" because they have not been cleared of the effect of terms whose argument differs from that of the term considered either by an angle of long period or by the mean elongation D. In all cases a result is entered under (iii.) based on the observations 1847–1901. In about fifty cases, or one in three, results are given (i.) for periods 1 to 48, or 1750 to 1804 ; (ii.) for period 49 to 89, or 1804 to 1851 ; or (i.) and (ii.) a single result for 1750 to 1851. The result (iii.) is only comparable with (i.) or (ii.) after allowance for difference of tabular place.

The method of obtaining the quantities in the third or fourth

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column has already been illustrated for the short-period terms with the mean anomaly as an example. For the terms of larger period see lxiv. June.

The fifth column gives the tabular coefficients (i.) Damoiseau's Tables modified by Airy and again by myself, see vol. lxiv. pp. 27–30, 571–573; (ii.) Hansen's Tables modified, see vol. lxiv. pp. 85, 414, 415.

The sixth column gives (i.) Hansen's theoretical coefficient, from the revised results in the "Darlegung" transformed by Professor Newcomb (*Astron. Papers Amer. Eph.*, vol. i.); (iii.) M. Radau's coefficient for planetary terms (Annales de l'Observatoire de Paris, *Mémoires*, xxi.), or in the case of four figure of Earth terms, Dr. G. W. Hill's coefficient (*Astron. Papers Amer. Eph.*, vol. iii.). These coefficients are marked R. H. respectively, to distinguish them from Hansen's solar terms.

The seventh column gives D_1 and D_2 from Professor Newcomb's "Transformation." They are Delaunay's coefficients before and after allowance for the higher terms not calculated.

The eighth column gives the observed coefficient. I only give them to 0″·1. From the third and fourth columns they can be deduced with a probable error of about 0″·05; but it did not seem worth while to apply probably erroneous corrections of less than 0″·1 to terms for which two independent theories in some cases agree to within 0″·01. Where the theoretical coefficients contain a secular term the observed coefficient in the eighth column is set down for the epoch 1875·0.

Table X.

"*Apparent Observed*" *Tabular and Theoretical Coefficients of* 149 *Terms in the Moon's Longitude.*

Reference No.	Argument. θ / $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of sin (i.) periods 1– 48, (ii.) „ 49– 89, (iii.) „ 86–133	cos	Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	D_1. D_2.	Concluded Observed Coefficients.
		″	″	″	″	″	″
109	2D − g + E − J	...	...	0·00	...	...	...
	1·0	(iii.) −0·22	+0·04	0·00	+ 0·10R	...	+ 0·2
86	g − g′ + ω − ω′	...	...	− 124·68	− 125·43	− 125·49	...
	D	...	...	...	...	− 125·98	...
	1·0	(iii.) 0·00	−0·14	− 124·90	...	...	− 124·9
91	2g − 2g′ + 2ω − 2ω′	...	...	+ 2370·10	+ 2369·75	+ 2369·74	...
	2D	...	...	...	...	+ 2369·74	...
	1·0	(iii.) −0·04	+0·05	+ 2370·14	...	...	+ 2370·2
95	3g − 3g′ + 3ω − 3ω′	...	...	+ 0·53	+ 0·41	+ 0·57	...
	3D	...	...	...	...	+ 0·54	...
	1·0	(iii.) −0·09	+0·01	+ 0·42	...	...	+ 0·5

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Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of sin (i.) periods 1– 48 (ii.) „ 49– 89 (iii.) „ 86–133	cos	Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	D_1. D_2.	Concluded Observed Coefficients.
		"	"	"	"	"	"
98	$4g-4g'+4\omega-4\omega'$	...	...	+ 13·94	+ 13·90	+ 13·89	...
	$4D$	...	...	...	...	+ 13·98	...
	1·0	(iii.) +0·09	−0·05	+ 13·90	...	...	+ 13·8
...	$5g-5g'+5\omega-5\omega'$	...	...	...	+ 0·01	+ 0·02	...
	$5D$	...	...	...	...	...	...
	1·0	(iii.) +0·08	−0·02	...	...	...	...
...	$5g-5g'+6\omega-6\omega'$	...	...	...	− 0·01	...	...
	$5D+\omega-\omega'$	...	...	...	...	...	...
	1·0	(iii.) 0·00	+0·03	...	...	...	...
96	$3g-3g'+4\omega-4\omega'$	...	...	− 0·90	− 0·64	− 0·83	...
	$3D+\omega-\omega'$	...	...	...	...	− 0·83	...
	1·0	(iii.) −0·01	−0·05	− 0·64	...	...	− 0·6
92	$2g-2g'+3\omega-3\omega'$	...	...	0·00	+ 0·28	+ 0·27	...
	$2D+\omega-\omega'$	...	...	...	...	...	...
	1·0	(iii.) +0·04	+0·09	+ 0·27	...	...	+ 0·2
87	$g-g'+2\omega-2\omega'$	...	...	− 28·80	− 28·56	− 29·50	...
	$D+\omega-\omega'$	...	...	...	...	− 28·32	...
	1·0	(iii.) +0·07	+0·04	− 28·60 + 0·07T	...	...	− 28·6
140	$\omega-\omega'$	(i.) −0·05	−0·15	+ 0·50	+ 1·33	+ 0·87	...
		(ii.) −0·35	−0·43	...	...	+ 0·87	...
	1·0	(iii.) +0·55	−0·36	+ 1·58	...	...	+ 1·0
85	$g-g'$	...	...	+ 148·10	+ 148·02	+ 147·46	...
	$D-\omega+\omega'$	...	...	...	...	+ 148·43	...
	1·0	(iii.) +0·03	−0·09	+ 148·03 − 0·28T.	...	...	+ 147·8
90	$2g-2g'+\omega-\omega'$	...	...	0·00	− 0·13	− 0·08	...
	$2D-\omega+\omega'$	...	...	...	...	...	...
	1·0	(iii.) +0·07	−0·01	− 0·13	...	...	− 0·2
94	$3g-3g'+2\omega-2\omega'$	...	...	+ 14·63	+ 14·60	+ 14·59	...
	$3D-\omega+\omega'$	...	...	...	...	+ 14·66	...
	1·0	(iii.) 0·00	+0·03	+ 14·60	...	...	+ 14·6

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Reference No.	Argument.	Apparent Tabular *minus* Observed Coefficients of			Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients.		Concluded Observed Coefficients.
	$\frac{\theta}{\sin\theta}$	(i.) periods (ii.) „ (iii.) „	sin	cos 1– 48 49– 89 86–133		Hansen. Radau (R). Hill (H).	D_1. D_2.	
			″	″	″	″	″	″
100	$5g-5g'+4\omega-4\omega'$		...	...	0·00	+ 0·29	+ 0·20	...
	$5D-\omega+\omega'$		...	...	...	...	...	...
	1·0	(iii.)	+0·08	−0·02	+ 0·29	...	...	+ 0·2
97	$3g-3g'+4\omega-2\omega'$		...	...	− 0·73	− 0·43	− 0·43	...
	$3D+\omega+\omega'$		...	...	...	...	− 0·43	...
	1·1	(iii.)	+0·07	0·00	− 0·39	...	...	− 0·4
...	$3g-3g'+2\omega-4\omega'$		...	...	...	...	...	...
	$3D-\omega-\omega'$		...	...	...	...	...	...
	1·1	(iii.)	+0·02	+0·02	...	...	...	...
...	$2g-2g'+4\omega-4\omega'$		...	...	...	− 0·03	− 0·01	...
	$2D+2\omega-2\omega'$		...	...	...	...	...	...
	1·1	(iii.)	+0·02	−0·09	...	...	...	...
138	$2\omega-2\omega'$	(i.)	−0·07	−0·29	0·00	− 0·23	− 0·16	...
		(ii.)	+0·26	+0·05	...	...	...	...
	1·0	(iii.)	−0·06	−0·01	− 0·27	...	...	− 0·2
89	$2g-2g'$		...	...	0·00	+ 0·19	+ 0·16	...
	$2D-2\omega+2\omega'$		...	...	...	...	...	...
	1·1	(iii.)	0·00	−0·01	+ 0·19	...	...	+ 0·2
99	$4g-4g'+6\omega-4\omega'$		...	...	0·00	− 0·17	− 0·14	...
	$4D+2\omega$		...	...	...	...	...	...
	1·3	(iii.)	−0·04	+0·05	− 0·15	...	...	− 0·1
93	$2g-2g'+4\omega-2\omega'$		...	...	− 0·54	− 0·54	− 0·54	...
	$2D+2\omega$		...	...	...	...	− 0·53	...
	1·3	(iii.)	+0·07	0·00	− 0·54	...	...	− 0·6
136	2ω	(i.)	−0·39	+0·30	+ 1·10	+ 1·09	+ 1·39	...
		(ii.)	−0·51	+0·05	...	...	+ 1·38	...
	1·1	(iii.)	−0·15	+0·06	+ 1·25	...	...	+ 1·4
88	$2g-2g'-2\omega'$		...	...	− 0·50	− 0·43	− 0·45	...
	$2D-2\omega$		...	...	...	...	− 0·45	...
	1·3	(iii.)	0·00	−0·06	− 0·43	...	...	− 0·4

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Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of sin (i.) periods (ii.) „ (iii.) „	cos 1– 48 49– 89 86–133	Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	D₁. D₂.	Concluded Observed Coefficients.
		″	″	″	″	″	″
...	$4g-4g'+2\omega-4\omega'$	...	...	...	− 0·01	− 0·01	...
	$4D-2\omega$	...	...	...	...	...	...
	1·3	(iii.) −0·02	+0·08	...	...	...	...
41	$4g-3g'+2\omega-2\omega'$	...	...	+ 1·16	+ 1·18	+ 1·11	...
	$4D+g'-2\omega+2\omega'$	...	...	...	...	+ 1·15	...
	1·1	(iii.) −0·03	+0·04	+ 1·18	...	...	+ 1·2
49	$2g-g'$	...	...	+ 9·60	+ 9·72	+ 9·59	...
	$2D+g'-2\omega+2\omega'$	...	...	...	...	+ 9·71	...
	1·2	(iii.) +0·02	−0·05	+ 9·72	...	...	+ 9·7
22	$g-\omega+\omega'$	(i.) +0·26	−0·04	0·00	− 0·38	− 0·26	...
	$D+g'-2\omega+2\omega'$	(ii.) +0·29	+0·01	...	...	...	...
	1·1	(iii.) −0·03	+0·02	− 0·38	...	...	− 0·3
134	$g'-2\omega+2\omega'$	(i.) (ii.) +0·01	+0·09	− 2·40	− 2·52	− 1·87	...
				...	...	− 2·27	...
	1·0	(iii.) −0·04	+0·14	− 2·56	...	...	− 2·5
13	$2g-3g'+4\omega-4\omega'$	...	...	− 0·50	− 0·36	− 0·67	...
	$2D-g'+2\omega-2\omega'$	...	...	...	...	− 0·67	...
	1·0	(iii.) +0·02	−0·09	− 0·36	...	...	− 0·4
71	$5g-4g'+4\omega-4\omega'$	...	...	+ 1·93	+ 1·98	+ 1·86	...
	$5D+g'-\omega+\omega'$	...	...	...	...	+ 1·88	...
	1·2	(iii.) +0·07	+0·04	+ 1·98	...	...	+ 1·9
16	$3g-2g'+2\omega-2\omega'$	...	...	+ 192·10	+ 191·95	+ 192·00	...
	$3D+g'-\omega+\omega'$	...	...	...	...	+ 192·00	...
	1·1	(iii.) +0·03	+0·02	+ 191·94	...	...	+ 191·9
50	$2g-g'+\omega-\omega'$	...	...	− 8·20	− 8·48	− 8·45	...
	$2D+g'-\omega+\omega'$	...	...	...	...	− 8·54	...
	1·1	(iii.) −0·12	+0·05	− 8·54	...	...	− 8·5
23	g	(i.) −0·20	−0·20	+22639·50	+22640·15	+22640·15	...
	$D+g'-\omega+\omega'$	(ii.) −0·22	+1·14	...	...	+22640·15	...
	1·0	(iii.) +0·16	−0·16	+22639·62	...	...	+22639·5

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Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of sin (i.) periods 1– 48, (ii.) „ 49– 89, (iii.) „ 86–133	cos	Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	D_1. D_2.	Concluded Observed Coefficients.
		″	″	″	″	″	″
113	$g+2\varpi-3J+7°$	(i.) +0·13	−0·02	+ 0·32	...	...	...
		(ii.) −0·17	−0·03	...	...	...	...
	1·0	(iii.) −0·10	−0·13	+ 0·32	+ 0·32R	...	+ 0·4
132	$3V-4E-2°$	(i.) (ii.) +0·16	+0·27	0·00 ...	... ...	... ...	... ...
	1·0	(iii.) +0·10	+0·08	0·00	− 0·18R	...	− 0·1
131	$g'-\omega+\omega'$	(i.) (ii.) +0·17	−0·23	+ 18·60 ...	+ 18·70 ...	+ 18·35 + 18·76	... ...
	1·0	(iii.) −0·08	+0·32	+ 18·60	...	...	+ 18·6
64	$g-2g'+2\omega-2\omega'$	...	...	+ 4586·34	+ 4586·56	+ 4586·24	...
	$D-g'+\omega-\omega'$	...	...	...	...	+ 4586·44	...
	1·0	(iii.) +0·03	−0·31	+ 4586·44	...	...	+ 4586·4
12	$2g-3g'+3\omega-3\omega'$	...	...	− 3·00	− 3·23	− 2·98	...
	$2D-g'+\omega-\omega'$	...	...	...	...	− 3·12	..
	1·0	(iii.) −0·06	+0·14	− 3·22	...	...	− 3·2
55	$3g-4g'+4\omega-4\omega'$	...	...	+ 38·46	+ 38·43	+ 38·31	...
	$3D-g'+\omega-\omega'$	...	...	...	...	+ 38·48	...
	1·0	(iii.) −0·01	0·00	+ 38·43	...	...	+ 38·4
108	$2D-E+J$	...	...	0·00	...	...	...
	1·0	(iii.) +0·23	−0·08	0·00	− 0·18R	...	− 0·2
83	$5g-6g'+6\omega-6\omega'$	...	...	0·00	+ 0·40	+ 0·26	...
	$5D-g'+\omega-\omega'$	...	...	...	...	...	...
	1·5	(iii.) −0·06	−0·02	+ 0·40	...	...	+ 0·4
42	$4g-3g'+4\omega-4\omega'$	...	...	− 0·20	− 0·29	− 0·29	...
	$4D+g'$	...	...	...	...	− 0·30	...
	1·0	(iii.) +0·04	+0·13	− 0·29	...	...	− 0·3
17	$3g-2g'+3\omega-3\omega'$	...	...	0·00	+ 0·15	+ 0·14	...
	$3D+g'$	...	...	...	...	...	...
	1·0	(iii.) −0·20	−0·20	+ 0·15	...	...	+ 0·3

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Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of sin	cos	Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	D_1. D_2.	Concluded Observed Coefficients.
		(i.) periods (ii.) „ (iii.) „	1– 48 49– 89 86–133				
		″	″	″	″	″	″
51	$2g-g'+2\omega-2\omega'$	...	...	− 24·48	− 24·45	− 24·60	...
	$2D+g'$	...	...	...	...	− 24·50	...
	1·0	(iii.) −0·17	+0·02	− 24·45 + 0·06T	...	...	− 24·5
24	$g+\omega-\omega'$	(i.) +0·27	−0·04	+ 17·90	+ 18·09	+ 18·08	...
	$D+g'$	(ii.) +0·89	+0·02	...	...	+ 18·08	...
	1·0	(iii.) +0·70	+0·29	+ 18·17	...	...	+ 17·5
107	$2D-g+3V-3E$	(i.) +0·58	+0·02	0·00	...	...	...
		(ii.) +0·90	−0·30	...	...	...	...
	1·0	(iii.) −0·39	−0·27	− 0·68	− 0·68R	...	− 0·7
128	g'	(i.) (ii.) −0·17	−0·10	− 669·63 + 1·63T	− 669·85	− 669·57	...
				...	...	− 669·76	...
	1·0	(iii.) − 0·38	−0·28	− 669·46 + 1·64T	...	...	− 668·2
106	$g-3V+3E$	...	...	0·00	...	...	...
	1·0	(iii.) +0·08	+0·01	0·00	− 0·14R	...	− 0·1
63	$g-2g'+\omega-\omega'$	...	...	− 0·40	− 0·60	− 0·55	...
	$D-g'$	...	...	...	...	− 0·56	...
	1·0	(iii.) +0·04	+0·05	− 0·59	...	...	− 0·6
11	$2g-3g'+2\omega-2\omega'$	...	...	+ 165·52	+ 165·52	+ 165·55	...
	$2D-g'$	...	...	...	...	+ 165·55	...
	1·0	(iii.) +0·07	+0·02	+ 165·56 − 0·39T	...	...	+ 165·2
70	$4g-5g'+4\omega-4\omega'$	...	...	+ 1·78	+ 1·89	+ 1·67	...
	$4D-g'$	...	...	...	...	+ 1·71	...
	1·1	(iii.) - 0·01	−0·07	+ 1·89	...	...	+ 1·9
43	$4g-3g'+4\omega-2\omega'$	...	...	0·00	− 0·38	− 0·37	...
	$4D+g'+2\omega'$	...	...	...	...	...	...
	1·1	(iii.) −0·02	+0·02	− 0·38	...	...	− 0·4
127	$g'+2\omega'$	(i.) (ii.) +0·21	−0·06	+ 1·50	+ 1·55	+ 1·43	...
				...	...	+ 1·43	...
	1·0	(iii.) +0·11	−0·02	+ 1·50	...	...	+ 1·4

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Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of: (i.) periods 1– 48, (ii.) „ 49– 89, (iii.) „ 86–133	sin	cos	Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	Theoretical Coefficients. D_1. D_2.	Concluded Observed Coefficients.
			″	″	″	″	″	″
25	$g+2\omega-2\omega'$	(i.)	0·00	−0·15	− 2·45	− 2·54	− 2·22	...
	$D+g'+\omega-\omega'$	(ii.)	+0·06	+0·12	...	...	− 2·35	...
	1·1	(iii.)	−0·06	−0·01	− 2·49	...	...	− 2·4
62	$g-2g'$		...	...	+ 2·59	+ 2·59	+ 2·49	...
	$D-g'-\omega+\omega'$		...	...	...	...	+ 2·59	...
	1·0	(iii.)	+0·05	−0·04	+ 2·57	...	...	+ 2·5
54	$3g-4g'+2\omega-2\omega'$		...	...	+ 0·74	+ 0·76	+ 0·68	...
	$3D-g'-\omega+\omega'$		...	...	...	...	+ 0·72	...
	1·1	(iii.)	+0·03	−0·04	+ 0·76	...	...	+ 0·7
72	$5g-4g'+6\omega-4\omega'$		...	...	0·00	− 0·20	− 0·16	...
	$5D+g'+\omega+\omega'$		...	...	...	...	...	...
	1·0	(iii.)	+0·03	−0·02	− 0·20	...	...	− 0·2
18	$3g-2g'+4\omega-2\omega'$		...	...	− 9·40	− 9·37	− 9·34	...
	$3D+g'+\omega+\omega'$		...	...	...	...	− 9·39	...
	1·1	(iii.)	+0·03	−0·05	− 9·37	...	...	− 9·4
26	$g+2\omega$	(i.)	+0·08	−0·08	− 39·56	− 39·58	− 39·54	...
	$D+g'+\omega+\omega'$	(ii.)	+0·01	−0·32	...	...	− 39·54	...
	1·2	(iii.)	+0·14	−0·05	− 39·28	...	...	− 39·5
61	$g-2g'-2\omega'$		...	...	− 6·20	− 6·36	− 6·37	...
	$D-g'-\omega-\omega'$		...	...	...	...	− 6·37	...
	1·1	(iii.)	+0·07	+0·05	− 6·44	...	...	− 6·5
73	$3g-g'$		...	...	+ 0·40	+ 0·67	+ 0·63	...
	$3D+2g'-3\omega+3\omega'$		..	...	...	...	+ 0·66	...
	1·6	(iii.)	−0·03	+0·02	+ 0·67	...	...	+ 0·7
7	$g+g'-2\omega+2\omega'$		...	...	0·00	− 0·18	− 0·07	...
	$D+2g'-3\omega+3\omega'$		...	...	...	...	...	...
	1·2	(iii.)	−0·02	+0·01	− 0·12	...	...	− 0·1
21	$6g-4g'+4\omega-4\omega'$		...	...	0·00	+ 0·22	+ 0·18	...
	$6D+2g'-2\omega+2\omega'$		...	...	...	...	+ 0·20	...
	1·2	(iii.)	−0·05	+0·04	+ 0·17	...	...	+ 0·2

L 2

Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of sin (i.) periods (ii.) „ (iii.) „	cos 1– 48 49– 89 86–133	Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	D_1. D_2.	Concluded Observed Coefficients.
		″	″	″	″	″	″
52	$4g-2g'+2\omega-2\omega'$	...	...	+14·10	+14·38	+14·40	...
	$4D+2g'-2\omega+2\omega'$	...	...	...	...	+14·40	...
	1·4	(iii.) +0·01	+0·01	+14·37	...	...	+14·4
74	$3g-g'+\omega-\omega'$	...	...	−0·40	−0·59	−0·57	...
	$3D+2g'-2\omega+2\omega'$	...	...	...	...	−0·60	...
	1·3	(iii.) −0·07	+0·06	−0·59	...	...	−0·5
27	$2g$	(i.) +0·15	−0·04	+769·04	+769·06	+769·12	...
	$2D+2g'-2\omega+2\omega'$	(ii.) +0·24	+0·08	...	...	+769·06	...
	1·0	(iii.) −0·01	−0·08	+769·06	...	...	+769·1
8	$g+g'-\omega+\omega'$	...	...	+1·58	+1·78	+1·50	...
	$D+2g'-2\omega+2\omega'$	...	...	...	...	+1·59	...
	1·1	(iii.) +0·18	−0·04	+1·80	...	...	+1·6
125	$2g'-2\omega+2\omega'$	(i.) (ii.) −0·11	−0·07	−211·75	−211·71	−211·46	...
				...	...	−211·84	...
	1·1	(iii.) −0·12	+0·01	−211·70	...	...	−211·6
59	$g-3g'+3\omega-3\omega'$	...	...	−1·21	−1·22	−1·17	...
	$D-2g'+2\omega-2\omega'$	...	...	...	...	−1·23	...
	1·1	(iii.) −0·02	−0·02	−1·25	...	...	−1·2
110	$2D-g-E+J$	...	...	...	...	...	...
	1·1	(iii.) +0·15	+0·01	...	−0·22R	...	−0·2
67	$2g-4g'+4\omega-4\omega'$	...	...	+30·75	+30·78	+30·52	...
	$2D-2g'+2\omega-2\omega'$	...	...	...	...	+30·72	...
	1·1	(iii.) −0·01	0·00	+30·78	...	...	+30·8
20	$4g-6g'+6\omega-6\omega'$	...	...	+0·54	+0·57	+0·40	...
	$4D-2g'+2\omega-2\omega'$	...	...	...	...	+0·51	...
	1·0	(iii.) 0·00	+0·02	+0·57	...	...	+0·6
75	$3g-g'+2\omega-2\omega'$	...	...	−2·90	−2·93	−2·96	...
	$3D+2g'-\omega+\omega'$	...	...	...	...	−2·96	...
	1·1	(iii.) −0·06	−0·16	−2·93	...	...	−2·9

Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of			Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients.		Concluded Observed Coefficients.
			sin	cos		Hansen. Radau (R). Hill (H).	D_1. D_2.	
		(i.) periods 1– 48 (ii.) „ 49– 89 (iii.) „ 86–133	″	″	″	″	″	″
28	$2g+\omega-\omega'$	(i.)	−0·32	+0·10	+ 1·00	+ 1·27	+ 1·22	...
	$2D+2g'-\omega+\omega'$	(ii.)	−0·27	+0·24	...	...	+ 1·21	...
	1·0	(iii.)	−0·04	+0·21	+ 1·28	...	...	+ 1·
9	$g+g'$		...	...	− 109·90	− 109·92	− 109·79	...
	$D+2g'-\omega+\omega'$		...	...	...	...	− 109·85	...
	1·0	(iii.)	+0·10	−0·04	− 109·95 + 0·18T	...	...	− 109·9
123	$2g'-\omega+\omega'$	(i.) (ii.)	−0·05	−0·08	0·00	+ 0·17	+ 0·14	...
					...	...	+ 0·14	...
	1·1	(iii.)	+0·09	−0·08	+ 0·15	...	...	+ 0·1
58	$g-3g'+2\omega-2\omega'$		...	...	+ 206·40	+ 206·46	+ 206·54	...
	$D-2g'+\omega-\omega'$		...	...	...	...	+ 206·34	...
	1·0	(iii.)	+0·05	+0·10	+ 206·49 − 0·49T	...	...	+ 206·1
66	$2g-4g'+3\omega-3\omega'$		...	...	0·00	− 0·23	− 0·18	...
	$2D-2g'+\omega-\omega'$		...	...	...	...	...	...
	1·0	(iii.)	+0·08	−0·06	− 0·23	...	...	− 0·3
3	$3g-5g'+4\omega-4\omega'$		...	...	+ 4·38	+ 4·41	+ 4·28	...
	$3D-2g'+\omega-\omega'$		...	...	...	...	+ 4·34	...
	1·0	(iii.)	−0·02	+0·01	+ 4·40	...	...	+ 4·4
76	$3g-g'+2\omega$		...	...	0·00	− 0·30	− 0·28	...
	$3D+2g'-\omega+3\omega'$		...	...	...	...	...	...
	1·0	(iii.)	+0·10	+0·15	− 0·30	...	...	− 0·4
29	$2g+2\omega-2\omega'$	(i.)	−0·16	+0·10	0·00	− 0·19	− 0·15	...
	$2D+2g'$	(ii.)	+0·32	−0·34	...	...	− 0·15	...
	1·0	(iii.)	+0·20	−0·32	− 0·19	...	...	− 0·2
122	$2g'$	(i.) (ii.)	−0·13	−0·08	− 7·50	− 7·51	− 7·49	...
					...	...	− 7·46	...
	1·1	(iii.)	+0·05	−0·04	− 7·49	...	...	− 7·5
65	$2g-4g'+2\omega-2\omega'$		...	...	+ 7·80	+ 8·13	+ 8·06	...
	$2D-2g'$		...	...	...	...	+ 8·06	...
	1·0	(iii.)	+0·01	−0·02	+ 8·12	...	...	+ 8·1

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Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of sin (i.) periods 1– 48, (ii.) „ 49– 89, (iii.) „ 86–133	cos	Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	D₁. D₂.	Concluded Observed Coefficients.
		″	″	″	″	″	″
19	$4g-6g'+4\omega-4\omega'$	...	...	0·00	+ 0·15	+ 0·10	...
	$4D-2g'$	...	...	...	...	...	...
	1·1	(iii.) −0·06	+0·03	+ 0·15	...	...	+ 0·2
53	$4g-2g'+4\omega-2\omega'$	...	...	− 5·74	− 5·74	− 5·73	...
	$4D+2g'+2\omega'$	...	...	...	...	− 5·73	...
	1·0	(iii.) +0·08	+0·02	− 5·75	...	...	− 5·8
77	$3g-g'+3\omega-\omega'$	...	...	0·00	+ 0·25	+ 0·24	...
	$3D+2g'+2\omega'$	...	...	...	...	...	...
	1·0	(iii.) −0·07	+0·06	+ 0·24	...	...	+ 0·3
30	$2g+2\omega$	(i.) +0·10	0·00	− 411·62	− 411·60	− 411·63	...
	$2D+2g'+2\omega'$	(ii.) −0·06	−0·04	...	...	− 411·63	...
	1·1	(iii.) +0·01	+0·11	− 411·60	...	...	− 411·6
10	$g+g'+\omega+\omega'$	...	...	+ 0·70	+ 0·55	+ 0·59	...
	$D+2g'+2\omega'$	...	...	...	...	+ 0·59	...
	1·1	(iii.) −0·24	+0·02	+ 0·57	...	...	+ 0·7
121	$2g'+2\omega'$	(i.) −0·01	−0·03	− 55·20	− 55·25	− 55·20	...
		(ii.)		...	...	− 55·17	...
	1·1	(iii.) +0·25	−0·02	− 54·98	...	...	− 55·2
57	$g-3g'+\omega-3\omega'$	...	...	− 0·20	− 0·32	− 0·26	...
	$D-2g'-2\omega'$	...	...	...	...	− 0·25	...
	1·0	(iii.) +0·03	+0·08	− 0·30	...	...	− 0·3
105	$2D-g-2V+2E$	...	...	...	...	...	...
	1·0	(iii.) +0·12	−0·02	...	− 0·17R	...	− 0·1
56	$g-3g'-2\omega'$	...	...	− 0·68	− 0·40	− 0·37	...
	$D-2g'-\omega-\omega'$	...	...	...	...	− 0·37	...
	1·1	(iii.) +0·03	+0·04	− 0·34	...	...	− 0·4
44	$5g-2g'+2\omega-2\omega'$	...	...	+ 0·80	+ 1·06	+ 1·06	...
	$5D+3g'-3\omega+3\omega'$	...	...	...	...	+ 1·06	...
	1·2	(iii.) +0·03	+0·04	+ 1·06	...	...	+ 1·0

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Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of: (i.) periods 1– 48, (ii.) " 49– 89, (iii.) " 86–133	sin	cos	Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	Theoretical Coefficients. D₁. D₂.	Concluded Observed Coefficients.
			″	″	″	″	″	″
31	$3g$	(i.)	+0·05	−0·03	+ 36·12	+ 36·13	+ 36·16	...
	$3D+3g'-3\omega+3\omega'$	(ii.)	+0·09	+0·06	...	...	+ 36·12	...
	1·1	(iii.)	−0·09	−0·08	+ 36·13	...	...	+ 36·2
38	$2g+g'-\omega+\omega'$		...	...	0·00	+ 0·12	+ 0·09	...
	$2D+3g'-3\omega+3\omega'$		...	...	...	...	...	...
	1·2	(iii.)	−0·01	+0·10	+ 0·12	...	...	+ 0·1
80	$g+2g'-2\omega+2\omega'$		...	...	− 13·24	− 13·19	− 13·15	...
	$D+3g'-3\omega+3\omega'$		...	...	...	...	− 13·32	...
	1·2	(iii.)	+0·04	−0·07	− 13·20	...	...	− 13·2
6	$g-4g'+4\omega-4\omega'$		...	...	+ 1·10	+ 1·18	+ 0·96	...
	$D-3g'+3\omega-3\omega'$		...	...	...	...	+ 1·08	...
	1·1	(iii.)	−0·07	+0·02	+ 1·18	...	...	+ 1·2
69	$3g-6g'+6\omega-6\omega'$		...	...	0·00	+ 0·29	+ 0·20	...
	$3D-3g'+3\omega-3\omega'$		...	...	...	...	...	...
	1·2	(iii.)	−0·01	+0·04	+ 0·29	...	...	+ 0·3
78	$4g-g'+2\omega-2\omega'$		...	...	0·00	− 0·29	− 0·27	...
	$4D+3g'-2\omega+2\omega'$		...	...	...	...	...	...
	1·0	(iii.)	+0·03	+0·04	− 0·29	...	...	− 0·3
39	$2g+g'$		...	...	− 7·68	− 7·67	− 7·62	...
	$2D+3g'-2\omega+2\omega'$		...	...	...	...	− 7·69	...
	1·1	(iii.)	−0·02	+0·01	− 7·67	...	...	− 7·7
120	$3g'-2\omega+2\omega'$	(i.)	−0·03	−0·07	− 8·66	− 8·66	− 8·66	...
		(ii.)			...	...	− 8·66	...
	1·2	(iii.)	0·00	−0·01	− 8·69	...	...	− 8·7
2	$2g-5g'+4\omega-4\omega'$		...	...	+ 2·75	+ 2·75	+ 2·69	...
	$2D-3g'+2\omega-2\omega'$		...	...	...	...	+ 2·75	...
	1·0	(iii.)	−0·04	+0·07	+ 2·75	...	...	+ 2·8
81	$g+2g'$		...	...	− 1·20	− 1·18	− 1·16	...
	$D+3g'-\omega+\omega'$		...	...	...	...	− 1·16	...
	1·0	(iii.)	−0·11	+0·01	− 1·18	...	...	− 1·1

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Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of sin (i.) periods 1– 48 (ii.) „ 49– 89 (iii.) „ 86–133.	cos	Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	D_1. D_2.	Concluded Observed Coefficients.
		″	″	″	″	″	″
5	$g-4g'+2\omega-2\omega'$	...	...	+7·50	+7·44	+7·50	...
	$D-3g'+\omega-\omega'$	...	...	...	...	+7·50	...
	1·0	(iii.) +0·01	+0·05	+7·42	...	...	+·4
68	$3g-6g'+4\omega-4\omega'$	...	...	0·00	+0·31	+0·22	...
	$3D-3g'+\omega-\omega'$	...	...	...	...	...	...
	1·0	(iii.) 0·00	+0·03	+0·31	...	...	+0·3
45	$5g-2g'+4\omega-2\omega'$	...	...	−1·00	−0·99	−0·98	...
	$5D+3g'-\omega+3\omega'$	...	...	...	...	−1·00	...
	1·0	(iii.) −0·03	−0·03	−0·99	...	...	−1·0
32	$3g+2\omega$	(i.) +0·25	0·00	−45·20	−45·09	−45·12	...
	$3D+3g'-\omega+3\omega'$	(ii.) −0·05	+0·31	...	...	−45·12	...
	1·0	(iii.) −0·10	−0·02	−45·08	...	...	−45·2
82	$g+2g'+2\omega'$	...	...	0·00	−0·18	−0·18	...
	$D+3g'-\omega+3\omega'$	...	...	...	...	−0·14	...
	1·0	(iii.) +0·05	+0·07	−0·14	...	...	−0·2
4	$g-4g'+2\omega-4\omega'$	...	...	0·00	+0·22	+0·34	...
	$D-3g'+\omega-3\omega'$	...	...	...	...	+0·34	...
	1·1	(iii.) −0·13	−0·03	+0·20	...	...	+0·3
119	$3g'$	(i.) (ii.) +0·07	+0·06	0·00	−0·08	−0·14	...
				...	...	...	...
	1·2	(iii.) −0·07	−0·08	...	...	...	0·0
1	$2g-5g'+2\omega-2\omega'$	...	...	0·00	+0·34	+0·25	...
	$2D-3g'$	...	...	...	...	...	...
	1·2	(iii.) +0·04	−0·03	+0·34	...	...	+0·3
40	$2g+g'+2\omega$	...	...	+1·02	+0·42	+0·42	...
	$2D+3g'+2\omega'$	...	...	...	...	+0·42	...
	1·1	(iii.) 0·00	0·00	+0·42	...	...	+0·4
118	$3g'+2\omega'$	(i.) (ii.) −0·12	−0·07	−2·30	−2·15	−2·17	...
				...	...	−2·17	...
	1·2	(iii.) +0·01	−0·02	−2·15	...	...	−2·2

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Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of	sin (i.) periods	cos 1– 48 (ii.) „ 49– 89 (iii.) „ 86–133	Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	D₁. D₂.	Concluded Observed Coefficients.
			″	″	″	″	″	″
33	$4g$	(i.)	−0·14	+0·03	+ 2·00	+ 1·94	+ 1·96	...
	$4D+4g'-4\omega+4\omega'$	(ii.)	+0·09	−0·07	...	...	+ 1·94	...
	1·1	(iii.)	+0·06	0·00	+ 1·93	...	...	+ 1·9
14	$2g+2g'-2\omega+2\omega'$		...	...	− 0·90	− 0·95	− 0·91	...
	$2D+4g'-4\omega+4\omega'$		...	...	...	...	− 1·00	...
	1·3	(iii.)	−0·01	+0·05	− 0·95	...	...	− 0·9
46	$3g+g'$		...	...	− 0·40	− 0·55	− 0·52	...
	$3D+4g'-3\omega+3\omega'$		...	...	...	...	− 0·56	...
	1·2	(iii.)	+0·06	+0·01	− 0·55	...	...	− 0·6
84	$g+3g'-2\omega+2\omega'$		...	...	− 0·30	− 0·48	− 0·49	...
	$D+4g'-3\omega+3\omega'$		...	...	...	...	− 0·49	...
	1·0	(iii.)	−0·01	+0·03	− 0·45	...	...	− 0·4
117	$4g'-2\omega+2\omega'$	(i.) (ii.)	+0·15	−0·01	0·00 ...	− 0·28 ...	− 0·28 ...	... ...
	1·4	(iii.)	+0·21	−0·02	− 0·13	...	...	− 0·3
60	$2g-6g'+4\omega-4\omega'$		...	...	0·00	+ 0·16	+ 0·11	...
	$2D-4g'+2\omega-2\omega'$		...	...	...	...	...	...
	1·1	(iii.)	+0·06	+0·07	+ 0·16	...	...	+ 0·
79	$6g-2g'+4\omega-2\omega'$		...	...	0·00	− 0·12	− 0·12	...
	$6D-4g'-2\omega+4\omega'$		...	...	...	...	...	...
	1·3	(iii.)	−0·01	0·00	− 0·12	...	...	− 0·1
34	$4g+2\omega$	(i.)	−0·14	−0·10	− 4·10	− 4·00	− 4·01	...
	$4D+4g'-2\omega+4\omega'$	(ii.)	−0·02	+0·06	...	...	− 4·01	...
	1·0	(iii.)	−0·01	+0·07	− 4·00	...	...	− 4·0
15	$2g+2g'+2\omega'$		...	...	+ 0·55	+ 0·56	+ 0·54	...
	$2D+4g'-2\omega+4\omega'$		...	...	...	...	+ 0·54	...
	1·0	(iii.)	+0·03	−0·07	+ 0·56	...	...	+ 0·5
48	$g-5g'+2\omega-2\omega'$		...	...	0·00	+ 0·26	+ 0·19	...
	$D-4g'+\omega-\omega'$		...	...	...	...	...	...
	1·0	(iii.)	−0·04	0·00	+ 0·26	...	...	+ 0·3

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Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of sin (i.) periods 1–48 (ii.) „ 49–89 (iii.) „ 86–133	cos	Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	D₁. D₂.	Concluded Observed Coefficients.
		″	″	″	″	″	″
47	$3g+g'+2\omega$	...	...	0·00	+ 0·27	+ 0·26	...
	$3D+4g'-\omega+3\omega'$	...	...	...	...	...	...
	1·0	(iii.) +0·05	+0·14	+ 0·27	...	...	+ 0·2
35	$4g+4\omega$	(i.) +0·06	−0·07	+ 0·40	+ 0·42	+ 0·42	...
	$4D+4g'+4\omega'$	(ii.) −0·06	−0·07	...	...	+ 0·42	...
	1·5	(iii.) −0·03	0·00	+ 0·42	...	...	+ 0·4
36	$5g$	(i.) −0·01	+0·04	+0·10	+ 0·11	+ 0·12	...
	$5D+5g'-5\omega+5\omega'$	(ii.) +0·09	+0·12	...	...	+ 0·11	...
	1·2	(iii.) +0·03	−0·10	+ 0·11	...	...	+ 0·1
37	$5g+2\omega$	(i.) −0·07	+0·04	− 0·30	− 0·33	− 0·33	...
	$5D+5g'-3\omega+5\omega'$	(ii.) −0·08	0·00	...	...	− 0·33	...
	1·0	(iii.) +0·02	+0·05	− 0·33	...	...	− 0·3
101	$2D-V+E$	...	...	...	...	...	...
	1·2	(iii.) −0·15	0·00	...	+ 0·10R	...	+ 0·1
102	$2D-g-V+E$	...	...	...	...	...	...
	1·7	(iii.) −0·05	−0·02	...	+ 0·14R	...	+ 0·1
103	$2D-2V+2E$	...	...	...	...	...	...
	1·3	(iii.) +0·13	+0·02	...	− 0·15R	...	− 0·1
104	$2D-g+2V-2E$	...	...	...	...	...	...
	1·3	(iii.) +0·03	−0·02	...	+ 0·19R	...	0·0
111	$g-2E+2J$	...	...	...	...	...	...
	1·0	(iii.) +0·26	−0·02	...	− 0·16R	...	− 0·3
115	$g+$ ☊	(i.) −0·39	0·00	...	...	...	...
		(ii.) −0·41	−0·03	...	...	...	...
	1·0	(iii.) −0·11	+0·12	+ 0·52	+ 0·52H	...	+ 0·5
116	$2g+2\omega+$ ☊	(i.) −0·07	−0·06	+ 0·30	...	...	...
	$2g+2\varpi-$ ☊	(ii.) +0·01	−0·08	...	...	...	...
	1·1	(iii.) +0·02	+0·08	+ 0·39	+ 0·39R	...	+ 0·4

Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of			Tabular Coefficients. (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	Theoretical Coefficients. D₁. D₂.	Concluded Observed Coefficients.
		(i.) periods 1– 48 (ii.) „ 49– 89 (iii.) „ 86–133	sin	cos				
			"	"	"	"	"	"
112	2D − *g* + 2E − 2J	(i.)	+0·13	+0·46	− 0·89	...	...	...
		(ii.)	+0·55	+0·06	...	...	...	...
	1·0	(iii.)	+0·24	+0·03	− 0·89	− 0·88R	...	− 1·1
114	*g* − ☊	(i.)	+0·51	+0·09	...	...	...	...
		(ii.)	+0·57	+0·15	...	...	...	...
	1·0	(iii.)	+0·14	+0·19	− 0·52	− 0·52H	...	− 0·5
129	2E − 2M	(i.) (ii.)	−0·30	+0·01	...	...	...	...
	1·0	(iii.)	−0·06	0·00	+ 0·24	+ 0·23R	...	+ 0·3
130	E − J	(i.) (ii.)	+0·02	−0·07	+ 0·70	...	...	...
	1·0	(iii.)	+0·01	−0·13	+ 0·74	+ 0·65R	...	+ 0·7
124	2E − 2J	(i.) (ii.)	+0·09	−0·01	− 0·20	...	...	...
	1·1	(iii.)	−0·05	−0·05	− 0·24	− 0·20R	...	− 0·2
133	E − 2J + 298°	(i.) (ii.)	−0·24	−0·06	...	...	...	...
	1·0	(iii.)	−0·16	+0·04	...	+ 0·17R	...	+ 0·2
134	V − E	(i.) (ii.)	−0·05	−0·11	− 0·80	...	...	...
	1·0	(iii.)	−0·34	−0·02	− 1·10	− 0·86R	...	− 0·8
126	2V − 2E	(i.) (ii.)	+0·11	+0·02	+ 0·40	...	...	...
	1·0	(iii.)	+0·14	−0·02	+ 0·43	+ 0·28R	...	+ 0·3
137	2V − 3E − 5°	(i.)	+0·05	+0·14	− 0·30 cos	...	...	...
		(ii.)	−0·13	+0·10	...	...	...	...
	1·1	(iii.)	+0·22	+0·24	...	− 0·35R cos	...	− 0·3 cos
141	J + 9°	(i.)	+0·44	+0·50	...	...	...	...
		(ii.)	−0·15	+0·19	...	...	...	...
	1·0	(iii.)	−0·06	+0·14	...	− 0·14R cos	...	− 0·1 cos

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Reference No.	Argument. $\frac{\theta}{\sin\theta}$.	Apparent Tabular *minus* Observed Coefficients of (i.) periods 1– 48 (ii.) „ 49– 89 (iii.) „ 86–133	sin	cos	Tabular Coefficients (i.) Airy modified. (iii.) Hansen modified.	Theoretical Coefficients. Hansen. Radau (R). Hill (H).	Theoretical Coefficients. D₁. D₂.	Concluded Observed Coefficients.
139	4M−2E+98°	(i.)	+0″·12	+0″·33	... ″	... ″	... ″	... ″
		(ii.)	+0·13	−0·18	...	...	...	...
	1·0	(iii.)	−0·04	−0·02	− 0·05 sin + 0·09 cos	− 0·09R sin + 0·06R cos	... ...	− 0·1 sin + 0·1 cos
142	2M−E+49°	(i.)	+0·67	+0·50	...	...	...	...
		(ii.)	+0·52	−0·50	...	...	...	...
	1·0	(iii.)	−0·41	−0·12	− 0·32	− 0·42R	...	− 0·4
143	2ϖ−2J	(i.)	−0·67	+0·87	...	...	...	...
		(ii.)	−0·39	+0·62	...	...	...	...
	1·0	(iii.)	−0·59	+0·73	...	+ 0·21R	...	+ 0·2
144	−☊	(i.)	+0·35	+0·97	− 6·60	...	...	...
		(ii.)	−0·21	+0·66	...	...	...	...
	1·0	(iii.)	−1·19	−0·18	− 7·34 sin − 0·71 cos	− 7·67H	...	− 6·6 sin − 0·7 cos

I add a few remarks on Table X.

If columns 80^s3, 80^c3, 53^s2, 53^c2, sin D, cos D, sin 2D, cos 2D, μ, and of course the column indicating the number of observations in Table VIII., be suppressed, we are left with 74 × 48 quantities, which have a mean value, without regard to sign, of ±0″·22. From this a probable error of ±0″·22 × 0·85 = ±0″·19 may be inferred, and consequently a probable error of ±0″·19 ÷ √48 = ±0″·027 for the quantities in third and fourth columns of Table X., line (iii.). We may expect, therefore, and in fact we find, that apparent cosine terms of over 0″·1, and apparent sine terms differing by 0″·1 from theory are exceedingly rare. Quantities of 0″·2 in the case of short-period terms may be regarded as almost certainly real, whether an explanation of them is forthcoming or not.

Now taking the entries of Table X. in the order of that table :

91. The observed variation is larger than the theoretical. As Professor Newcomb has explained, this may be attributed to the conditions of observation (" Corrections to Hansen's Tables," 1876, p. 8).

96. A term with characteristic *ee′*, where Hansen's coefficient is clearly preferable to Delaunay's.

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87. Same remark as 96.

140. A term of nine years' period. Less accuracy may be expected in the observed coefficient. Delaunay's value is preferable to Hansen's.

85. Same remark as 96.

138. The first fifty years of the Airy period in many cases seem less accurate than the second fifty years. See term 141.

136. A similar remark to 140. Period, three years.

134. }
13. } Similar remark as 96 ; characteristic e^2e'.

23. The principal elliptic inequality. This must be considered in connection with the terms 50 and 131. If we ignore these "allied" terms, the principal elliptic inequality would seem to be 22639″·71 from Airy and 22639″·46 from Hansen, a difference of 0″·25. But in term 50 Airy's tabular place exceeds Hansen's by $+0''\cdot34 \sin(g+\mathrm{D})$, which for a "$g$" analysis produces the apparent effect of $-0''\cdot17 \sin g$. This reduces the discordance to 0″·08. The full statement for the value of the principal elliptic inequality is this : Let $-8''\cdot54+\alpha$ and $+18''\cdot60+\beta$ be the true coefficients of $\sin(g+\mathrm{D})$ and $\sin(g-\mathrm{D})$ respectively, corresponding to an approximate value 22639″·5 of the principal elliptic coefficient, then the principal elliptic coefficient according to the Airy period (1750–1851) is

$$22639''\cdot54+\tfrac{1}{2}\alpha+\tfrac{1}{2}\beta,$$

and according to the Hansen period (1847—1901) it is

$$22639''\cdot46+\tfrac{1}{2}\alpha+\tfrac{1}{2}\beta.$$

We know that the theoretical terms $g\pm\text{☊}$, $g\pm\mathrm{A}'$ when A' denotes the argument of the 273 year *Venus* term ($\mathrm{A}'-30^\circ\cdot2$ is Professor Newcomb's A defined numerically—lxiv. p. 421), combine with terms in $\sin\text{☊}\cos g$, $\sin\mathrm{A}'\cos g$; while terms in $\sin g$ in both cases cancel out. There are undoubtedly other long-period terms which theory has not yet accounted for, and we may expect the same rule to hold good for these terms as well. Now if means for seventeen periods at a time be taken in the coefficients of $\sin g$ in vol. lxiv. p. 415 and Table IX. of this paper, and the coefficients of $\sin g$ thereby cleared of terms $g\pm\text{☊}$, $g\pm(\omega-\omega')$, $2\mathrm{D}-g+3\mathrm{V}-3\mathrm{E}$, &c., it will be found that the values thus smoothed exhibit no trace of long-period inequalities, thus confirming the analogy with the theoretical long-period terms.

23 continued. The observed cosine term is a measure of the value of $\frac{1}{9}\Delta g$, where Δg is the error of the tabular mean anomaly. We may expect to find—and in fact I have found—traces of long inequalities in the values of $\cos g$. The observed coefficient $+1''\cdot14$ in 23 (ii.) shows how erroneous Airy's mean anomaly had become in the first half of the nineteenth century. Airy,

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moreover, omits all long-period inequalities. I must hold over, for the present, the discussion of motion of the perigee.

64. The observed and theoretical evections are in close accordance. This disposes of a correction of Hansen's.

51. If the tabular coefficients of terms 24 and 107 were so altered that 24 (iii.) $+0{\cdot}70$ sin disappeared, I should expect to find 51 (iii.) $-0{\cdot}17$ sin approximately change sign, and in deducing the observed coefficient for 1875 I have taken this consideration into account.

24, 107. The argument of 107 exceeds the argument of 24 by $80^\circ{\cdot}77-4{\cdot}2557(p-44)$ at the middle of my pth period of analysis. The excess is therefore 163°, 334°, 162° for the middle of the periods denoted by (i.), (ii.), (iii.) respectively. Also in periods (i.) and (iii.) one argument gains 200° upon the other, and in period (ii.) 170°; putting $2\theta = 200^\circ$ and 170°, we have $\dfrac{\theta}{\sin\theta} = 1{\cdot}8$ and $1{\cdot}5$. These data are sufficient to follow through the effect of altering the tabular coefficients to $+17''{\cdot}5$ and $-0''{\cdot}7$.

To 24 (i.) we have to apply corrections
$-0''{\cdot}4$ sin $-0''{\cdot}7\div1{\cdot}8$ sin (arg. $+163^\circ$) $=-0''{\cdot}1$ cos.

To 24 (ii.)
$-0''{\cdot}4$ sin $-0''{\cdot}7\div1{\cdot}5$ sin (arg. $+334^\circ$) $=-0''{\cdot}8$ sin $+0''{\cdot}2$ cos.

To 24 (iii.)
$-0''{\cdot}7$ sin.

To 107 (i.)
$-0''{\cdot}7$ sin $-0''{\cdot}4\div1{\cdot}8$ sin (arg. -163°) $=-0''{\cdot}5$ sin $+0''{\cdot}1$ cos

To 107 (ii.)
$-0''{\cdot}7$ sin $-0''{\cdot}4\div1{\cdot}5$ sin (arg. -334°) $=-0''{\cdot}9$ sin $-0''{\cdot}1$ cos.

To 107 (iii.)
$-0''{\cdot}7\div1{\cdot}8$ sin (arg. -162°) $=+0''{\cdot}4$ sin $+0''{\cdot}1$ cos.

The application of these corrections to the observed coefficients reduces them considerably. Of course the concluded observed values are not of the same order of accuracy as in the more simple cases. Nevertheless, the concluded value $+17''{\cdot}5$ is extremely discordant from theory. There is moreover a cosine term as well. I can only refer to my remarks on lxiv. p. 692.

128. A similar remark to 51.

70. A term with characteristic e', where Hansen's coefficient is preferable to Delaunay's.

127. A similar remark to 140. Period, nearly one year.

25. A similar remark to 70. Characteristic ee'^2.

28. There is a suspicion of an empirical term $+0''{\cdot}3$ sin (arg. $-\phi$) where ϕ (in degrees) = Year $-$ 1775 approximately. Of course I do not consider the term as demonstrated.

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29. Again a suspicion of a small empirical term.

32. Again a suspicion of a small empirical term.

112, 114. The argument of 112 exceeds the argument of 114 by $320^\circ\cdot42+1^\circ\cdot4889\,(p-44)$ at the middle of my pth period of analysis. The excess is therefore 292°, 358°, 58° for the middle of the periods denoted by (i.), (ii.), (iii.) respectively. Also the relative motion is so slow that $\frac{\theta}{\sin\theta} \doteq 1\cdot0$ approximately. If the tabular coefficients be altered to $-1''\cdot0$ and $-0''\cdot5$, then the following corrections must be applied :

To 112 (i.)

$$-0''\cdot1\sin -0''\cdot5\sin(\text{arg.} -292^\circ) = -0''\cdot3\sin -0''\cdot5\cos.$$

To 112 (ii.)

$$-0''\cdot1\sin -0''\cdot5\sin(\text{arg.} -358^\circ) = -0''\cdot6\sin.$$

To 112 (iii.)

$$-0''\cdot1\sin.$$

To 114 (i.)

$$-0''\cdot5\sin -0''\cdot1\sin(\text{arg.} +292^\circ) = -0''\cdot5\sin +0''\cdot1\cos.$$

To 114 (ii.)

$$-0''\cdot5\sin -0''\cdot1\sin(\text{arg.} +358^\circ) = -0''\cdot6\sin.$$

To 114 (iii.)

$$-0''1\sin(\text{arg.} +\ 58^\circ) = \qquad -0''\cdot1\cos.$$

The application of these corrections to the apparent observed coefficients reduces them considerably. In particular the $+0''\cdot46\cos$ in 112 (i.) is accounted for. The coefficient of $\sin(g-\Omega)$ is the same as that of $\sin(g+\Omega)$ with its sign changed.

142, 143, 144. The argument of 143 exceeds the argument of 142 by $233^\circ-2^\circ\cdot414\,(p-44)$ at the middle of my pth period ; the argument of 143 exceeds the argument of 144 by $320^\circ+1^\circ\cdot520\,(p-44)$; for the middle of periods denoted by (i.), (ii.), (iii.) the excess of 143 over 142 is 280°, 173°, 76° respectively ; the excess of 143 over 144 is 292°, 357°, 58° respectively ; and consequently the excess of 144 over 142 is 348°, 176°, 18° respectively. The values of $\frac{\theta}{\sin\theta}$ for periods (i.) and (iii.) are 1·2 for 142, 143 ; 1·1 for 143, 144 ; 1·7 for 142, 144 ; for period (ii.) the same quantities are 1·1, 1·0, 1·4. With these data the effect of altering the tabular coefficients to

$$-0''\cdot4,\ +0''\cdot2 \text{ and } -6''\cdot6\sin -0''\cdot7\cos$$

may be followed through. We have to apply the corrections

To 142 (i.)

$$-0''\cdot4\sin+(0''\cdot2\div1\cdot2)\sin(\text{arg.}+280^\circ)-(0''7\div1\cdot7)\cos(\text{arg.}+348^\circ)$$
$$= -0''\cdot5\sin-0''\cdot6\cos.$$

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To 142 (ii.)

$$-0''\cdot4 \sin + (0''\cdot2 \div 1\cdot1) \sin (\text{arg.} + 173^\circ) - (0''\cdot7 \div 1\cdot4) \cos (\text{arg.} + 176^\circ)$$
$$= -0''\cdot6 \sin + 0''\cdot4 \cos.$$

To 142 (iii.)

$$-0''\cdot1 \sin + (0''\cdot2 \div 1\cdot2) \sin (\text{arg.} + 76^\circ) + (0''\cdot7 \div 1\cdot7) \sin (\text{arg.} + 18^\circ)$$
$$= +0''\cdot3 \sin + 0''\cdot3 \cos.$$

To 143 (i.)

$$+0''\cdot2 \sin - (0''\cdot4 \div 1\cdot2) \sin (\text{arg.} - 280^\circ) - (0''\cdot7 \div 1\cdot1) \cos (\text{arg.} - 292^\circ)$$
$$= +0''\cdot7 \sin - 0''\cdot6 \cos.$$

To 143 (ii.)

$$+0''\cdot2 \sin - (0''\cdot4 \div 1\cdot1) \sin (\text{arg.} - 173^\circ) - (0''\cdot7 \div 1\cdot0) \cos (\text{arg.} - 357^\circ)$$
$$= +0''\cdot5 \sin - 0''\cdot7 \cos.$$

To 143 (iii.)

$$+0''\cdot2 \sin - (0''\cdot1 \div 1\cdot2) \sin (\text{arg.} - 76^\circ) + (0''\cdot7 \div 1\cdot1) \sin (\text{arg.} - 58^\circ)$$
$$= +0''\cdot5 \sin - 0''\cdot5 \cos.$$

To 144 (i.)

$$-0''\cdot7 \cos - (0''\cdot4 \div 1\cdot7) \sin (\text{arg.} - 348^\circ) + (0''\cdot2 \div 1\cdot1) \sin (\text{arg.} + 292^\circ)$$
$$= -0''\cdot2 \sin - 0''\cdot9 \cos.$$

To 144 (ii.)

$$-0''\cdot7 \cos - (0''\cdot4 \div 1\cdot4) \sin (\text{arg.} - 176^\circ) + (0''\cdot2 \div 1\cdot0) \sin (\text{arg.} + 357^\circ)$$
$$= +0''\cdot5 \sin - 0''\cdot7 \cos.$$

To 144 (iii.)

$$+0''\cdot7 \sin - (0''\cdot1 \div 1\cdot7) \sin (\text{arg.} - 18^\circ) + (0''\cdot2 \div 1\cdot1) \sin (\text{arg.} + 58^\circ)$$
$$= +0''\cdot8 \sin + 0''\cdot2 \cos.$$

These corrections reduce the quantities in columns 3 and 4 considerably, but $-0''\cdot4$ sin is still left as a residual in 144 (iii.). I must acknowledge the help I have received from Mr. Nevill's paper (lxiv. p. 588), and it will be noticed that the theoretical term $-0''\cdot3$ cos ☊ does not seem to be consistent with the observations.

I conclude with a list of errata, one in Hansen's tables, the rest in my papers.

Hansen's Tables de la Lune, p. 30, line 5 from bottom, *for* 69·1 *read* 169·1.

In consequence of the above (*Monthly Notices*, lxiv. p. 163) coefficient of $\sin(-g-2g')$ *for* +0·709 *read* 1·18, *for* $0''\cdot475$ *read* $0''\cdot0$. This error has been corrected in term 81 of Table X., where the comparison of observation with theory led to its discovery. The erratum in Hansen is a mere printer's error, and does not go further in his tables.

Other Errata.

lxiv.	415.	Period 98, last column.		*For* −6 *read* +6.
"	571.	Reference No.	1.	*For* $+124''\cdot68$ *read* $-124''\cdot68$.
"		"	4.	*For* −2370·10 *read* +2370·10.
"	572.	"	6.	*Read* − 24·48.
"		"	34.	*Read* + 0·316.
"		"	13.	*For* 0·42 *read* 1·02 (last column). Delete "term omitted by Airy."

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lxiv. 572. Reference No. 16. *For* 0·38 *read* 0·68 (last column). Delete "term omitted by Airy."
" " 30. *For* 0·43 *read* 0·73 (last column). Delete "term omitted by Airy."
" 691. *For* argument 2ω *read* $180° + 2\omega$.

Mean Areas and Heliographic Latitudes of Sun-spots in the Year 1903, *deduced from Photographs taken at the Royal Observatory, Greenwich, at Dehra Dûn (India), and in Mauritius.*

(*Communicated by the Astronomer Royal.*)

The results here given are in continuation of those printed in the *Monthly Notices*, vol. lxiii. p. 464, and are deduced from the measurements of photographs taken at the Royal Observatory, Greenwich, at Dehra Dûn, India, and at the Royal Alfred Observatory, Mauritius.

Table I. gives the mean daily area of umbræ, whole spots, and faculæ for each synodic rotation of the Sun in 1903; and Table II. gives the same particulars for the entire year 1903 and the two preceding years for the sake of comparison. The areas are given in two forms: first, projected areas, that is to say, as seen and measured on the photographs, these being expressed as millionths of the Sun's apparent disc; and next, areas as corrected for foreshortening, the areas in this case being expressed in millionths of the Sun's visible hemisphere.

Table III. exhibits for each rotation in 1903 the mean daily area of the whole spots (corrected for foreshortening), and the mean heliographic latitude of the spotted area, for spots north and for spots south of the equator; together with the mean heliographic latitude of the entire spotted area, and the mean distance from the equator of all spots; and Table IV. gives the same information for the year as a whole, similar results for 1901 and 1902 being added, as in the case of Table II. Tables II. and IV. are thus in continuation of the similar tables for the years 1874 to 1888 on pp. 381 and 382 of vol. xlix. of the *Monthly Notices*, and for the years 1889 to 1902 on pp. 465 and 466 of vol. lxiii.

The rotations in Table I. and Table III. are numbered in continuation of Carrington's series (*Observations of Solar Spots made at Redhill*, by R. C. Carrington, F.R.S.), No. 1 being the rotation commencing 1853 November 9. The assumed prime meridian is that which passed through the ascending node at mean noon of 1854 January 1, and the assumed period of the Sun's sidereal rotation is 25·38 days. The dates of the commencement of the rotations are given in Greenwich civil time, reckoning from mean midnight.